



**National Aeronautics and  
Space Administration  
Langley Research Center**

**Scientific and Technical  
Information Program Office**

# **Scientific and Technical Aerospace Reports**

# STAIR

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## NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

- Access the NASA STI program home page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Phone the NASA STI Help Desk at (301) 621-0390
- Write to:  
NASA STI Help Desk  
NASA Center for AeroSpace Information  
7115 Standard Drive  
Hanover, MD 21076-1320

# Introduction

*Scientific and Technical Aerospace Reports (STAR)* is an online information resource listing citations and abstracts of NASA and worldwide aerospace-related scientific and technical information (STI). Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related research and development (R&D) results.

*STAR* subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

*STAR* includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

## The NASA STI Program

The NASA STI Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces, and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up-to-date NASA STI, visit the STI Program's Web site at <http://www.sti.nasa.gov>.

# NASA STI Availability Information

## NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at [help@sti.nasa.gov](mailto:help@sti.nasa.gov). Others should visit the program at [www.sti.nasa.gov](http://www.sti.nasa.gov). The 'search selected databases' button provides access to the NASA Technical Reports Server (NTRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the [STI Online Order Form](#), e-mail to [help@sti.nasa.gov](mailto:help@sti.nasa.gov), or telephone the STI Help Desk at 301-621-0390. Before ordering you may access [price code tables](#) for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

## National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at <http://www.ntis.gov>.

## The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** to ensure access for the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal depository libraries at <http://www.gpoaccess.gov/index.html>.

## The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at <http://www.uspto.gov/patft/>.

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# SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

*A Biweekly Publication of the National Aeronautics and Space Administration*

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01

## AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

**20080012300** NASA, Washington, DC USA

### **Payload deployment method and system**

Barnett, Clifford J., Inventor; Greenwood, John E., Inventor; Holman, Earl V., Inventor; August 29, 1989; 7 pp.; In English  
Patent Info.: Filed April 15, 1988; US-PATENT-4,860,974; US-PATENT-APPL-SN-182000; No Copyright; Avail.: CASI:  
A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012300>

A method and apparatus for deploying the payload of space shuttle craft or the like. The payload rotated about an axis outside of the payload but approximately longitudinally of the cargo bay of the shuttle craft. The payload may thus be rotated, through ninety degrees. In this case, that is in its rotated position, the payload may or may not have a small portion located within the cargo bay. Alternatively, the payload may be located completely outside of the bay. According to the apparatus two separable hinge-like devices connect at one longitudinal side or edge of the payload to respective ones of the payload trunnions at different longitudinally spaced locations along the length of the payload. Separation of the payload from the cargo bay is made unlatching a latch and by the use of a repulsion spring at the position of each hinge-like device. Two four-link mechanisms allow movement between payload and bay. Such accommodative movement is required especially during launch when considerable vibration is encountered.

Official Gazette of the U.S. Patent and Trademark Office

*Space Shuttle Payloads; Aeronautical Engineering*

02

## AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also 34 Fluid Mechanics and Thermodynamics.

**20080000995** Sydney Univ., Australia

### **Multi-Objective and Multidisciplinary Design Optimisation (MDO) of UAV Systems using Hierarchical Asynchronous Parallel Evolutionary Algorithms**

Damp, L; Gonzalez, L F; Srinivas, K; Sep 17, 2007; 100 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA520905P0585; AOARD-044078

Report No.(s): AD-A472621; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472621>

Project report from basic science initiative to use Hierarchical Asynchronous Parallel Evolutionary Algorithms for MDO of a UAV system using high fidelity analysis tools. Two production UAV wings were examined for aerodynamic and structural properties. Optimization was performed over 48 design variables.

DTIC

*Aerodynamics; Algorithms; Optimization; Software Development Tools; Synchronism; Wings*



**20080001146** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Unsteady Low-Reynolds Number Aerodynamics for Micro Air Vehicles (MAVs)**

Ol, Michael V; Aug 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-A07C

Report No.(s): AD-A472788; AFRL-VA-WP-TM-2007-3080; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents recent progress in in-house research in the AFRL Air Vehicles Directorate on unsteady aerodynamics at low Reynolds number. The application is the aerodynamics and flight dynamics of agile Micro Air Vehicles, to include flapping-wings. Experiments included quantitative and qualitative flowfield velocimetry on the Selig SD7003 airfoil, undergoing a range of harmonic and ramp motions in two degrees of freedom - that is, pitch and plunge. Relevant classical results in the literature have been confirmed, with new results on spanwise flow in the starting-vortex for plunge motions of high reduced frequency.

DTIC

*Aerodynamics; Low Reynolds Number; Reynolds Number; Unsteady Aerodynamics*

**20080001627** Royal Melbourne Inst. of Tech, Victoria, Australia

**Replication of Atmospheric Conditions for the Purpose of Testing MAVs. MAV Flight Environment Project**

Milbank, J; Loxton, B; Watkins, S; Melbourne, W H; Dec 23, 2005; 84 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0452

Report No.(s): AD-A473081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473081>

Final report on project to measure low-altitude turbulence and configure the wind tunnel at RMIT University to be able to replicate turbulence conditions.

DTIC

*Atmospheric Physics; Meteorology; Wind Tunnel Tests*

**20080001722** NASA Langley Research Center, Hampton, VA, USA

**Off-Design Reynolds Number Effects for a Supersonic Transport**

Owens, Lewis R.; Wahls, Richard A.; Rivers, S. Melissa; [2005]; 38 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 23-719-45-G1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001722>

A high Reynolds number wind tunnel test was conducted to assess Reynolds number effects on the aerodynamic performance characteristics of a realistic, second-generation supersonic transport concept. The tests included longitudinal studies at transonic and low-speed, high-lift conditions across a range of chord Reynolds numbers (8 million to 120 million). Results presented focus on Reynolds number and static aeroelastic sensitivities at Mach 0.30 and 0.90 for a configuration without a tail. Static aeroelastic effects, which mask Reynolds number effects, were observed. Reynolds number effects were generally small and the drag data followed established trends of skin friction as a function of Reynolds number. A more nose-down pitching moment was produced as Reynolds number increased because of an outward movement of the inboard leading-edge separation at constant angles of attack. This study extends the existing Reynolds number database for supersonic transports operating at off-design conditions.

Author

*Aerodynamic Characteristics; Mach Number; Reynolds Number; Supersonic Transports; Wind Tunnel Tests*

**20080001882** Naval Academy, Annapolis, MD USA

**Variability and Model Adequacy in Simulations of Store-Induced Limit Cycle Oscillations**

Myers, Ashley S; May 3, 2007; 48 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473326; USNA-TSPR-356; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A prominent phenomenon of the transonic flight regime is the potential for limit cycle oscillation (LCO) development. LCO is a stable oscillation produced by aeroelastic interactions within a component of the aircraft. Such oscillation shortens the fatigue life of the aircraft and increases the amount of maintenance necessary. These aspects are of great concern to the aerospace industry, particularly with high performance military aircraft that are required to operate beyond their planned service lives. The research here focused specifically on the aircraft wing and the influence of external stores attached to that

wing on its aeroelastic properties. Monte Carlo simulations were performed to estimate the probability of a wing undergoing limit cycle oscillations due to external stores. Simulations were conducted with a finite element structural model of a wing coupled with multiple subsonic and transonic unsteady aerodynamics solvers to compare computational cost and accuracy. The results provide guidance for implementing probabilistic analysis methods with industry-standard software to predict dangerous aeroelastic response processes that sometimes occur during flight tests. For the low transitional Mach numbers (between 0.7 and 0.88), the linear aerodynamic model was found to be a viable alternative to the more computationally costly alternatives. For Mach numbers above 0.88, nonlinear, viscous methods were necessary.

DTIC

*Aeroelasticity; Computerized Simulation; Oscillations; Simulation; Variability*

**20080001911** Georgia Inst. of Tech., Atlanta, GA USA

**Fluidic Control of Virtual Aerosurfaces**

Glezer, Ari; Apr 2007; 71 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0028

Report No.(s): AD-A473359; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This experimental research has focused on modifying the global aerodynamic characteristics of lifting surfaces at cruise (low) angles of attack when the baseline flow is fully attached. Using hybrid actuators, trapped vorticity concentrations at the leading and trailing edges affect aerodynamic forces and moment without control surfaces. Hybrid actuators employ miniature obstructions with integrated synthetic jet actuators. Actuation on the pressure surface near the leading edge results in a substantial (up to 50%) reduction in pressure drag and total drag (29%) with virtually no loss in lift, leading to a higher lift to drag ratio. When the actuation is applied near the trailing edge, the effects are bi-directional changes in pitching moments, which can be continuously varied by controlling the actuation amplitude. Moreover, the same performance can be achieved at substantially reduced actuation power by exploiting transitory aerodynamic effects through pulse modulation. PIV studies of the flow in the vicinity of the actuators, in the boundary layer and the wake, were used in this investigation.

DTIC

*Aerodynamic Characteristics; Control Equipment; Fluidics*

### 03

## AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety and 85 Technology Utilization and Surface Transportation.

**20080000438** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Optimal Control Strategies for Constrained Relative Orbits**

Irvin ,Jr, David J; Sep 2007; 227 pp.; In English

Report No.(s): AD-A472293; AFIT/DS/ENY/07-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472293>

The US Air Force's ability to protect space assets is enhanced by a proficiency in satellite proximity operations and Space Situational Awareness (SSA). In pursuit of that proficiency, this research develops a key capability of interest to mission planners; the ability of a deputy satellite to 'hover' within a defened volume fixed in the vicinity of a chief satellite for an extended period of time. This research finds optimal trajectories, produced with discrete-thrusts, that minimize fuel spent per unit time and stay within the user-defened volume, thus providing a practical hover capability in the vicinity of the chief. The work assumes the Clohessy-Wiltshire closeness assumption between the deputy and chief is valid, however, elliptical chief orbits are allowed. Using the new methodology developed in this work, feasible closed and non-closed relative orbits are found and evaluated based on a fuel criterion and compared to an easily calculated continuous-thrust baseline. It is shown that in certain scenarios the discrete-thrust solution provides the lowest overall fuel cost. These scenarios are generally constrained to a smaller total time-of-flight. A simple check is proposed that enables the mission planner to make the correct strategy choice.

DTIC

*Hovering; Optimal Control; Orbits*

**20080000547** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Common Aero Vehicle Autonomous Reentry Trajectory Optimization Satisfying Waypoint and No-Fly Zone Constraints**

Jorris, Timothy R; Sep 2007; 166 pp.; In English

Contract(s)/Grant(s): Proj-07-298

Report No.(s): AD-A472301; AFIT/DS/ENY/07-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To support the Global Strike mission, an autonomous trajectory optimization technique is presented to minimize the flight time, satisfy terminal and intermediate constraints, and remain within the specified vehicle heating and control limitations. 'Waypoints' are specified for reconnaissance or multiple payload deployments and 'no-fly zones' are specified for geopolitical restrictions or threat avoidance. The Hypersonic Cruise Vehicle (HCV) is used as a simplified two-dimensional platform to compare multiple solution techniques. The solution techniques include a unique geometric approach, an analytical dynamic optimization technique, and a numerical approach. This numerical technique is a direct solution method involving pseudospectral methods and nonlinear programming to converge to the optimal solution. The Common Aero Vehicle (CAV) is used as the test platform for the full three-dimensional reentry trajectory optimization problem. The culmination of this research is the verification of the optimality of this proposed numerical technique, as shown for both the two-dimensional and three-dimensional models. Lastly, user implementation strategies are presented to improve accuracy and enhance solution convergence.

DTIC

*Aerospace Vehicles; Autonomy; Hypersonic Flight; Optimization; Reentry Trajectories; Reentry Vehicles; Trajectories; Trajectory Optimization*

**20080000565** Department of Defense, Arlington, VA USA

**Acquisition: Acceptance and Surveillance of F-16 Mission Training Center Simulation Services**

Nov 1, 2006; 43 pp.; In English

Report No.(s): AD-A472328; IG/DOD-D-2007-008; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In June 1999, the Air Force awarded a contract to Lockheed Martin Integrated Systems to acquire F-16 aircraft simulation services. The Air Force planned to use the simulation services, which include cockpit simulators, to provide mission training to its F-16 pilots. The Contractor was required to develop, deliver, and maintain Mission Training Centers that provided simulation services in accordance with Government approved performance specifications that included simulating advanced F-16 missions.

DTIC

*Education; F-16 Aircraft; Fighter Aircraft; Flight Simulators; Flight Training; Jet Aircraft; Simulation; Surveillance*

**20080000639** General Dynamics Advanced Information Systems, Dayton, OH USA

**Collaboration Technologies and the Supervisory Control of UCAVS in Tactical C2: Effects on Performance and Workload**

Funke, Gregory J; Bennett, April M; Nelson, W T; Galster, Scott M; May 2007; 10 pp.; In English

Contract(s)/Grant(s): FA8650-06-C-6755; Proj-7184

Report No.(s): AD-A472498; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The present study was an initial attempt to characterize team performance, workload, and situational awareness associated with two types of UCAV control schemes coupled with several collaboration technologies. Six people participated in a simulated suppression of enemy air defense (SEAD) mission, which required cooperation between all participants in order to meet mission objectives. UCAVs were controlled by UCAV operators and supervised by air battle managers (ABMs) or controlled directly by ABMs. Participants could communicate verbally, through instant messages, and on some trials, using a virtual whiteboard. Results of the experiment indicated that team performance was negatively impacted by direct UCAV control and communication using the virtual whiteboard.

DTIC

*Combat; Drone Vehicles; Pilotless Aircraft; Situational Awareness; Workloads (Psychophysiology)*

**20080000640** Defence Science and Technology Organisation, Edinburgh, Australia

**The Safety of Aircraft Exposed to Electromagnetic Fields: HIRF Testing of Aircraft Using Direct Current Injection**

Leat, Chris; Jun 2007; 113 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472511; DSTO-RR-0329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Even the original developers of Bulk Current Injection now make the point that the use of BCI at aircraft level will

become increasingly difficult. Direct Current Injection has the potential to replace aircraft level BCI, while also solving many of the longstanding problems of BCI. These problems include lack of synergism, inaccurate current distribution within bundles and limited numbers of injection sites due to time and cost considerations. However, calibration, the question of how much power to apply as a function of frequency, is much more complex to answer for DCI than BCI. One potential method of calibration, the use of modal skin currents, is developed in this work. This is the first time that DCI calibrated using skin-currents has been shown to generate cable currents which are at least as accurate as BCI. Power levels of approximately 20 kW are required for small aircraft. Numerical modelling based on Method of Moments, and skin and bundle current measurements are employed.

DTIC

*Direct Current; Electromagnetic Fields; Injection; Safety*

**2008000809** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Air Force KC-X Aerial Refueling Tanker Aircraft Program**

May 30, 2007; 44 pp.; In English

Report No.(s): AD-A472197; ODIGAD-D-2007-103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472197>

Why You Should Read This Report. This report discusses efforts by Air Force acquisition officials to develop an acquisition strategy to ensure that the Air Force maintains competition throughout the life-cycle of the Air Force KC-X Aerial Refueling Tanker Aircraft Program (the KC-X Program). Background. On March 29, 2004, we issued DoD Inspector General Report No. D-2004-064, Acquisition of the Boeing KC-767A Tanker Aircraft, that identified deficiencies and shortcomings in the acquisition strategy that the Air Force developed to lease Boeing KC-767A Tanker aircraft. Since then, the Air Force revised its acquisition strategy and plans to recapitalize the aerial tanker fleet by developing three consecutive acquisition programs: KC-X, KC-Y, and KC-Z. The intention of those programs was to represent different tanker aircraft platforms. The KC-X Program is a major Defense acquisition program that will provide worldwide, day and night, and adverse weather aerial refueling to USA, allied, and coalition military aircraft. The KC-X aircraft are to replace approximately one-third of the warfighting capability provided by the current aerial refueling fleet of KC-135 tanker aircraft. On January 30, 2007, the Air Force issued a request for proposal for the KC-X Program. As of April 2007, the system development and demonstration phase of the program, which includes the manufacture of four test aircraft, is scheduled to begin in the first quarter of FY 2008 with low-rate initial production projected to begin in FY 2010. The Air Force plans to purchase 179 aircraft under the KC-X Program and for the first 43 aircraft, the Air Force projects program costs to total about \$13 billion through FY 2013.

DTIC

*Acquisition; Air to Air Refueling; Government Procurement; Refueling; Tanker Aircraft*

**2008000959** Library of Congress, Washington, DC USA

**Air Force Aerial Refueling Methods: Flying Boom versus Hose-and-Drogue**

Bolkcom, Christopher; Klaus, Jon D; May 11, 2005; 12 pp.; In English

Report No.(s): AD-A472542; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472542>

Decisions on the composition of the Air Force aerial refueling fleet were made decades ago, when the primary mission was to refuel long-range strategic bombers. Modifications have been made to many of these tanker aircraft (KC-135s and KC-10s) to make them more effective in refueling fighter aircraft. This report, which will be updated, examines the balance between two different refueling methods in today's refueling fleet 'flying boom' and 'hose-and-drogue.'

DTIC

*Air to Air Refueling; Hoses; Refueling; Towed Bodies*

**2008000991** Naval Air Warfare Center, Patuxent River, MD USA

**Revised Anthropometric Restrictions for U.S. Navy and Marine Corps Rotary Wing, Trainer, and C-130 Aircraft and U.S. Coast Guard HH-65 and HU-25**

Tucker, Heather; Crawford, Jennifer; Brattin, Lori; Reason, William; Kennedy, Greg; Sep 21, 2001; 31 pp.; In English

Report No.(s): AD-A472617; NAWCADPAX/TR-2001/140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472617>

NAVAIRSYSCOM (PMA-202) tasked NAWCAD Patuxent River, Maryland, (AIR-4.6) to perform a baseline

accommodation assessment of existing U.S. Navy (USN) and U.S. Marine Corps (USMC) rotary wing aircraft and their respective trainer aircraft and establish anthropometric restriction codes (ARC's) as appropriate. The assessment also determined the estimated percentage of future candidate aviators suitable for flight duty in a particular aircraft with respect to their measured anthropometric characteristics. The percents reported were based on the population data set used to provide seven test cases cited in the Joint Services Specification Guidance 2010-3. The methods used in the assessment were different than procedures historically used to determine USN and USMC aviator suitability and to verify cockpit design. A multivariate statistical approach was employed and served as the basis for determining the safe accommodation envelopes for each platform/crew station. Revised ARC's are presented and the respective percents accommodated are summarized.

DTIC

*Anthropometry; C-130 Aircraft; Coasts; Helicopters; Military Aircraft; Navy; Rotary Wings; Training Aircraft; Training Devices*

**20080001009** Library of Congress, Washington, DC USA

**Air Force Aerial Refueling**

Bolkcom, Christopher; Mar 20, 2007; 7 pp.; In English

Report No.(s): AD-A472647; CRS-RS20941; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472647>

Aerial refueling aircraft are key to air operations. The U.S. tanker fleet is large and effective, but old. Modernizing or replacing the current fleet of tankers presents the Department of Defense (DOD) with difficult choices in terms of desired capabilities, force structure, and budget. How this fleet will be maintained or replaced, and on what schedule, has proven controversial. This report will be updated as events warrant.

DTIC

*Air to Air Refueling; Refueling*

**20080001031** Army Research Lab., Aberdeen Proving Ground, MD USA

**Using Computational Fluid Dynamics-Rigid Body Dynamic (CFD-RBD) Results to Generate Aerodynamic Models for Projectile Flight Simulation**

Costello, Mark; Gatto, Stephen; Sahu, Jubaraj; Sep 2007; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472701; ARL-TR-4270; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472701>

A method to efficiently generate a complete aerodynamic description for projectile flight dynamic modeling is described. At the core of the method is an unsteady, time-accurate computational fluid dynamics simulation that is tightly coupled to a rigid projectile flight dynamic simulation. A set of short time snippets of simulated projectile motion at different Mach numbers is computed and employed as baseline data. For each time snippet, aerodynamic forces and moments and the full rigid body state vector of the projectile are known. With time-synchronized air loads and state vector information, aerodynamic coefficients can be estimated with a simple fitting procedure. By inspecting the condition number of the fitting matrix, we can assess the suitability of the time history data to predict a selected set of aerodynamic coefficients. The technique is exercised on an exemplar fin-stabilized projectile with good results.

DTIC

*Aerodynamic Characteristics; Computational Fluid Dynamics; Flight Simulation; Models; Projectiles; Rigid Structures*

**20080001041** Institute of Aviation Medicine, Fuerstenfeldbruck, Germany

**Preparing the German Air Force for Deployment - The Stress Concept of the General Surgeon**

Willkomm, Bernd; Apr 1, 2006; 5 pp.; In English

Report No.(s): AD-A472717; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472717>

No abstract available

*Armed Forces; Deployment; Education; Flying Personnel; Surgeons*

**20080001048** Institute of Aviation Medicine, Fuerstenfeldbruck, Germany

**Early Interventions After Critical Incidents - Application**

Petrie, Stefanie; Apr 2006; 9 pp.; In English

Report No.(s): AD-A472735; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472735>

No abstract available

*Aircraft Accidents; Critical Loading; Emergencies; Flying Personnel; Management Methods*

**20080001194** Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD USA

**The Parachute Ankle Brace: Entanglements and Injuries After Controlling for Extrinsic Risk Factors**

Knapik, Joseph J; Darakjy, Salima; Swedler, David; Manning, Fred; Hauret, Keith G; Amoroso, Paul; Jones, Bruce H; Mar 10, 2007; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472929; USACHPPM-12-MA01Q2-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Previous studies have demonstrated that the parachute ankle brace (PAB) reduces ankle injuries during military airborne operations. This investigation reevaluated the PAB controlling for extrinsic risk factors. Injury incidence among airborne students wearing the PAB was compared to those not wearing the PAB. Covariate data were collected on extrinsic risk factors including wind speed, type of jump (administrative-nontactical versus combat load) and time of day (day versus night). A total of 596 injuries occurred in 102,784 jumps. After controlling for covariates in a multivariate model, students who did not wear the brace were 1.90 (95%CI=1.24-2.90) times more likely to experience an ankle sprain, 1.47 (95%CI=0.82-2.63) times more likely to experience an ankle fracture, and 1.75 (95%CI=1.25-2.48) times more likely to experience an ankle injury of any type. Injuries to other parts of the lower body (exclusive of the ankle) were not significantly influenced by the brace. The incidences of parachute entanglements were similar among students wearing and not wearing the PAB. Thus, after controlling for covariates known to effect injury rates, the PAB protected against ankle injuries and especially ankle sprains while not influencing parachute entanglements and other lower body injuries exclusive of the ankle.

DTIC

*Injuries; Parachutes; Protectors; Risk*

**20080001618** NASA Langley Research Center, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA

**The Naturalistic Flight Deck System: An Integrated System Concept for Improved Single-Pilot Operations**

Schutte, Paul C.; Goodrich, Kenneth H.; Cox, David E.; Jackson, Bruce; Palmer, Michael T.; Pope, Alan T.; Schlecht, Robin W.; Tedjojuwono, Ken K.; Trujillo, Anna C.; Williams, Ralph A.; Kinney, J. Bryan; Barry, John S., Jr.; December 2007; 63 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 609866.02.07.07

Report No.(s): NASA/TM-2007-215090; L-19285; Copyright; Avail.: CASI: A04, Hardcopy

This paper reviews current and emerging operational experiences, technologies, and human-machine interaction theories to develop an integrated flight system concept designed to increase the safety, reliability, and performance of single-pilot operations in an increasingly accommodating but stringent national airspace system. This concept, know as the Naturalistic Flight Deck (NFD), uses a form of human-centered automation known as complementary-automation (or complemation) to structure the relationship between the human operator and the aircraft as independent, collaborative agents having complimentary capabilities. The human provides commonsense knowledge, general intelligence, and creative thinking, while the machine contributes specialized intelligence and control, extreme vigilance, resistance to fatigue, and encyclopedic memory. To support the development of the NFD, an initial Concept of Operations has been created and selected normal and non-normal scenarios are presented in this document.

Author

*Artificial Intelligence; Systems Integration; Automation; Aircraft Pilots; Flight Operations; Human Factors Engineering; Avionics*

**20080001673** Carleton Univ., Ottawa, Ontario Canada

**Tactical Aviation Mission System Simulation Situational Awareness Project**

Herdman, C M; LeFevre, J; Apr 2004; 514 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473148; DRDC-CR-2007-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473148>

This document reports on the Department of National Defence (DND) Tactical Aviation Mission System Simulation

(TAMSS) Situation Awareness (SA) project. The TAMSS SA project was conducted at the Centre for Applied Cognitive Research (CACR) at the Carleton University. In accord with the original goals of this project, the deliverables included the development of a CH146 Griffon simulation capability at the CACR, the development of a theoretical framework to guide the evaluation process, three experiments that both assessed an engineering system and a theoretical framework, and this document, which summarizes the TAMSS SA project and provides a link to acquisition programs and to potential simulation-based training applications. The TAMSS SA project provides a guide for the implementation of simulation-based evaluation on a cost-effective platform. The combination of the CSE framework and the research-enabling simulation environment that was developed in the TAMSS SA project can be used to reduce risk and enhance value in acquisition programs. Collaboration among the Carleton University CACR researchers, including graduate students, and from the visits from many DND personnel, subject matter experts, and industry representatives, has demonstrated the value of locating these activities in a research-rich environment.

DTIC

*Combat; Distributed Interactive Simulation; Flight Simulation; Simulation; Situational Awareness*

**20080001831** RAND Corp., Santa Monica, CA USA

**Supporting the Future Total Force: A Methodology for Evaluating Potential Air National Guard Mission Assignments**

Lynch, Kristin F; Drew, John G; Sleeper, Sally; Williams, William A; Masters, James M; Luangkesorn, Louis; Tripp, Robert S; Lichter, Dahlia S; Roll, Charles R; Jan 2007; 265 pp.; In English

Contract(s)/Grant(s): F49642-01-C-0003; FA7014-06-C-0001

Report No.(s): AD-A473242; RAND/MG-539-AF; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Manpower end-strength reductions of active duty personnel in the U.S. Air Force are making it more difficult to support the air and space expeditionary force construct using current force employment practices. The Air National Guard (ANG), however, will not undergo significant manpower reductions but will be affected by plans that call for the retirement of a significant number of its aircraft, leaving it with a large number of highly trained, highly experienced personnel with no aircraft to operate and support. The authors develop a methodology to evaluate missions that could be transferred from the active component to the ANG without significant cost to the total force. They conclude that four areas-Predator operations and support, air mobility command and control, Commander of Air Force forces staffing, and base-level intermediate maintenance-are missions that could benefit from ANG assignment.

DTIC

*Armed Forces (United States); Management Planning; Military Personnel*

**20080001871** European Aeronautic Defence and Space Co., Munich, Germany

**Interaction Methods for Virtual Reality Applications**

Vogelmeier, Leonhard; Neujahr, Harald; Sandl, Peter; Jun 2006; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473315; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Aircraft; Human-Computer Interface; Man Machine Systems; Virtual Reality*

**20080001891** Lumir Research Inst., Grayslake, IL USA

**Evaluating Mission Training Fidelity Requirements: Examining Key Issues in Deployability and Trainability**

Schreiber, Brian T; Bennett, Jr, Winston; Rickard, Robert; Bell, Jeffry; France, Michael; Greschke, David; Jun 2006; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473338; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Combat; Education; Transfer of Training*

**20080001938** RAND Corp., Santa Monica, CA USA

**Absorbing and Developing Qualified Fighter Pilots. The Role of the Advanced Simulator**

Marken, Richard S; Taylor, William W; Ausink, John A; Hanser, Lawrence M; Anderegg, C R; Wickman, Leslie; Jan 2007; 92 pp.; In English

Contract(s)/Grant(s): FA7014-06-C-0001

Report No.(s): AD-A473419; RAND/MG-597-AF; No Copyright; Avail.: Defense Technical Information Center (DTIC)

What does an individual need to be considered an experienced fighter pilot? The current formal definition is based on how

many flying hours a person has, but in practice, the question is more complex and sometimes subjective because an individual requires different kinds of experience for combat positions and staff positions. The authors surveyed training experts to discover practical bases for judgments about the experience needed for different jobs. For flying positions, they found that time in advanced simulators is now also considered to be an important component of experience. Upgrade levels 'say, from wingman to flight lead' and types of sorties flown are factors for both flying and staff positions. The results suggest that it is time for the Air Force to consider revising the view that a pilot is experienced or not is based only on the number of hours flown. The Air Force needs to measure and credit different types of experience-including time spent in advanced simulator systems-when revising its definitions of pilot experience.

DTIC

*Armed Forces (United States); Fighter Aircraft; Flight Training; Jet Aircraft; Military Personnel; Pilots; Simulators*

**2008002253** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Guidance for Development of a Flight Simulator Specification**

Martin, Edward A; May 2007; 270 pp.; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A473149; AFRL-HE-WP-SR-2007-0002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473149>

A long-standing problem in the acquisition of flight simulators has been the clear communication of requirements through the specification process. There are numerous reasons for this, including obfuscation by technical jargon, fragmentation of requirements within a specification, and a human inclination to adopt cut and paste' approaches which may reflect the requirements of a precedent system more than those of the current system. In an attempt to address these problems, this document was developed as basis for a tool in the form of a generic flight simulator specification that will guide specification development for a diverse range of flight simulator applications. Each generic specification paragraph includes recommendations and rationale for specification language, verification, and options. Guidance reflects the requirements established by civil regulatory agencies, such as the international Civil Aviation Organization's criteria for the qualification of flight simulators, as well as those unique requirements related to military applications. This generic guidance specification is embodied in a software format that makes it relatively easy to use, so as to encourage its use. When it is used, the documents produced will reflect the high degree of standardization imposed by this guidance specification. It will provide a clear alternative to less-disciplined cut-and-paste approaches. Standardized format and vocabulary will help avoid misplaced information and inconsistent interpretations. Localization and integration of requirements will minimize conflicts.

DTIC

*Flight Simulators; Civil Aviation; Military Technology*

**2008002409** Naval Postgraduate School, Monterey, CA USA

**Evaluation of Naval Aviation Enterprise AIRSpeed's Generation of Measurable Cost Savings and Reinvestment for Recapitalization of the Future Navy and Marine Corps**

Williams, Robert J; Jun 2007; 117 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473593; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473593>

Naval Aviation, faced with budgetary pressures, decreasing buying power and increasing costs of aircraft and equipment, realized it had to change the way it did business in order to recapitalize. The Naval Aviation Enterprise (NAE) was formed to implement the aviation components of Sea Power 21 and Sea Enterprise, including modernization and recapitalization. Through the implementation of AIRSpeed, the NAE strives to provide the right amount of readiness at the right cost, so that money can be saved and returned to the Navy and Marine Corps to recapitalize the Fleet. This thesis examines the NAE's effort to generate measurable cost savings toward recapitalization. The background and implementation of AIRSpeed are reviewed. It identifies cost savings attributed to AIRSpeed initiatives and investigates the relationship between costs savings and reinvestment and recapitalization. The results of this thesis reveal that the NAE is achieving measurable cost savings, but the cost saving has not been made available for recapitalization. The thesis reveals some identifiable organizational challenges and change issues that inhibit the achievement of NAE's goals. These findings are used to develop and present a series of recommendations to assist the leadership to further align AIRSpeed programs with the recapitalization vision.

DTIC

*Airspeed; Cost Reduction; Military Aviation; Navy*



**20080002537** Naval Research Lab., Monterey, CA USA

**An Assessment of the Meteorological Conditions Leading to the NOAA WP-3D Engine Compressor Stalls of February 9, 2007, Due to Sea Salt Aerosol Particle Fouling**

Reid, Jeffrey S; Eleuterio, Daniel P; Cook, B J; Walker, Annette L; Richardson, Kim A; Westphal, Douglas L; Zhang, Jianglong; Damiano, A B; McNamara, Richard J; Mayeaux, Martin; Oct 25, 2007; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473677; NRL/MR/7540-07-9080; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the findings from a meteorological analysis of the NOAA WP-3D N42RF engine compressor stalls of February 9, 2007, which nearly led to the loss of the aircraft. Preliminary engineering and meteorological analysis performed by the NOAA pointed to sea salt fouling when the aircraft encountered super concentrations of sea salt aerosol particles in the atmosphere at an altitude above 1 km. To the authors' knowledge, this type of sea salt event is previously unrecorded in the peer-reviewed literature. Utilizing a combination of model, satellite, and in situ data, they tracked the flight environment for three research flights as part of the 2007 Ocean Winds Winter Experiment (OWWE) out of St. John's, Newfoundland, where the aircraft experienced hurricane force winds. Among the questions addressed were what conditions can lead to super concentrations of sea salt in the marine atmosphere and why was there a failure on the Feb 9 flight and not on others? In this particular case, the aircraft track took it into the dry slot behind the bent-back warm-type occluded front of a North Atlantic explosive cyclogenesis event. In this environment, dry polar air is advected at high wind speeds over the relatively warm waters of the Gulf Stream. This led to an environment of high winds, high seas, and massive atmospheric instability and turbulence along a 400 km fetch without precipitation. This allowed giant-sized sea salt particles to be well mixed in the marine boundary layer. By the authors' estimations, marine boundary layer heights for this flight were 1200 to 1500 m, well above the flight level of the aircraft. In comparison, other OWWE flights may have experienced high winds, but not the other causal factors determined for Feb 9. Lastly, since the WP-3D was intersecting warm, moist, and sea salt-laden updrafts in between longer periods of drier environments, it is possible that increased sea salt accretion developed through the oscillating wet-dry cycle.

DTIC

*Aerosols; Aircraft Engines; Boundary Layers; Compressors; Fouling; Marine Environments; Marine Meteorology; Sea Water; Seas; Weather*

## 04

### AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications, Spacecraft Communications, Command and Tracking; and 32 Communications and Radar.

**20080001522** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Tightly-Coupled Image-Aided Inertial Navigation Using the Unscented Kalman Filter**

Ebcin, S; Veth, M; Jan 2007; 12 pp.; In English

Report No.(s): AD-A473019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Accurate navigation information 'position, velocity, and attitude' can be determined using optical measurements from imaging sensors combined with an inertial navigation system. This can be accomplished by tracking the locations of stationary optical features in multiple images and using the resulting geometry to estimate and remove inertial errors. In previous research efforts, we have demonstrated the effectiveness of fusing imaging and inertial sensors using an extended Kalman filter 'EKF' algorithm. In this approach, the image feature correspondence search was aided using the inertial sensor measurements, resulting in more robust feature tracking. The resulting image-aided inertial algorithm was tested using both simulation and experimental data. While the tightly-coupled approach stabilized the feature correspondence search, the overall problem remained prone to filter divergence due to the well-known consequences of image scale ambiguity and the nonlinear measurement model. These effects are evidenced by the consistency divergence in the EKF implementation seen during our long-duration/Monte-Carlo simulations. In other words, the measurement model is highly sensitive to the current parameter estimate, which invalidates the linearized measurement model assumed by the EKF. The unscented 'sigma-point' Kalman filter 'UKF' has been proposed in the literature in order to address the large class of recursive estimation problems which are not well-modeled using linearized dynamics and Gaussian noise models assumed in the EKF. The UKF leverages the unscented transformation in order to represent the state uncertainty using a set of carefully chosen sample points. This approach maintains mean and covariance estimates accurate to at least second order, by using the true nonlinear dynamics and

measurement models. In this paper, a variation of the UKF is applied to the DTIC

*Inertial Navigation; Kalman Filters; Navigation Aids*

**20080001692** Massachusetts Inst. of Tech., Cambridge, MA USA

**Investigating the Use of Color in Timeline Displays**

Cummings, M L; Tsonis, C; Xing, J; Aug 2007; 20 pp.; In English

Report No.(s): AD-A473201; DOT/FAA/AM-07/24; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473201>

The use of color-coding in human supervisory control displays such as those found in air traffic control is a design intervention meant to mitigate task complexity and reduce mental workload. Color has been shown to aid operators in search and organization tasks; however, it can also cause cognitive tunneling and add to task complexity. This paper details the results from an experiment designed to evaluate increasing color categories in an attempt to objectively measure how the use of color in air traffic control-related displays affects performance. Results showed that the use of six color categories, as compared to three, significantly improved subjects' accuracy in performing search and problem-solving tasks. However, beyond six color categories, performance accuracy was not significantly aided and was possibly degraded. In addition, errors of omission significantly increased when the number of color categories increased from six to nine. This study demonstrated that, especially under high workloads, color categorization beyond six groupings added to overall task complexity as a function of workload, even more than an environmental complexity factor that depends on task requirements.

DTIC

*Air Traffic Control; Color; Display Devices*

**20080002300** NASA Ames Research Center, Moffett Field, CA, USA

**Experimental Evaluation of an Integrated Datalink and Automation-Based Strategic Trajectory Concept**

Mueller, Eric; September 18, 2007; 15 pp.; In English; 7th AIAA Aviation Technology, Integration and Operations Conference (ATIO), 18-20 Sep. 2007, Belfast, Ireland; Original contains color illustrations

Report No.(s): AIAA Paper-2007-7777; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002300>

This paper presents research on the interoperability of trajectory-based automation concepts and technologies with modern Flight Management Systems and datalink communication available on many of today's commercial aircraft. A tight integration of trajectory-based ground automation systems with the aircraft Flight Management System through datalink will enable mid-term and far-term benefits from trajectory-based automation methods. A two-way datalink connection between the trajectory-based automation resident in the Center/TRACON Automation System and the Future Air Navigation System-1 integrated FMS/datalink in NASA Ames B747-400 Level D simulator has been established and extensive simulation of the use of datalink messages to generate strategic trajectories completed. A strategic trajectory is defined as an aircraft deviation needed to solve a conflict or honor a route request and then merge the aircraft back to its nominal preferred trajectory using a single continuous trajectory clearance. Engineers on the ground side of the datalink generated lateral and vertical trajectory clearances and transmitted them to the Flight Management System of the 747; the airborne automation then flew the new trajectory without human intervention, requiring the flight crew only to review and to accept the trajectory. This simulation established the protocols needed for a significant majority of the trajectory change types required to solve a traffic conflict or deviate around weather. This demonstration provides a basis for understanding the requirements for integration of trajectory-based automation with current Flight Management Systems and datalink to support future National Airspace System operations.

Author

*Automatic Control; Data Links; Interoperability; Trajectories; Systems Integration; Aircraft Communication*

## AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

**20080000343** NASA Dryden Flight Research Center, Edwards, CA, USA

### **F-15B Quiet Spike Aeroservoelastic Ground and Flight Test**

Brenner, Martin J.; Kukreja, SUnil L.; [2007]; 27 pp.; In English; Aerospace Flutter and Dynamics Council Meeting, 17-18 May 2007, Savannah, GA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000343>

This viewgraph presentation reviews aeroservoelastic analyses of the F-15B Quiet Spike aircraft that includes ground and flight tests.

CASI

*Aeroservoelasticity; Flight Tests; Ground Tests; F-15 Aircraft; Aircraft Structures*

**20080000396** Dayton Univ. Research Inst., OH USA

### **Quick Reaction Evaluation of Materials and Processes. Delivery Order 0010: Bonded Boron Patch Repair Evaluation**

Jacobs, Nick J; Sep 2006; 62 pp.; In English

Contract(s)/Grant(s): F33615-03-D-5607-0010; Proj-4349

Report No.(s): AD-A472214; UDR-TR-2006-00205; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472214>

The C-141 weep-hole repair, performed in the early 1990s, was the first widespread application of a bonded boron composite repair on a critical structure. This program involved the evaluation of the residual strength and integrity of the bonded boron repairs from aircraft that were decommissioned and to be scrapped. A total of 67 residual strength tests were performed, including 54 original bonded boron composite repaired specimens, 4 new bonded repair specimens, and 9 baseline residual strength specimens. The test specimens consisted of the bonded repair with a substantial amount of the surrounding lower wing structure to allow the specimen to be gripped for testing. A novel Stereo-Optic non-contact surface strain field mapping system was used to characterize the patch/specimen load interaction, strain concentrations at the patch tips, as well as patch delamination events at high stresses. The results of the project indicate that the bonded boron repair provided significant residual strength after 10 years of accumulated flight time. There appears to be little difference in residual strength of the original repairs as compared to new bonded repairs utilizing the same materials and methods. Of the 54 original repairs tested, a total of nine repairs exhibited some degree of patch failure during the tests, all of which occurred at relatively high stresses.

DTIC

*Boron; C-141 Aircraft; Maintenance; Transport Aircraft*

**20080000400** Societe d'Applications Generales d'Electricite et de Mecanique, Paris, France

### **Image Processing for Tactical UAV**

Broekaert, M; Duclos, D; Sirieix, M; May 1, 2005; 38 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472219>

No abstract available

*Drone Vehicles; Image Processing; Infrared Imagery*

**20080000407** Cranfield Univ., Cranfield, UK

### **A Stepped Frequency CW SAR for Lightweight UAV Operation**

Morrison, Keith; May 2005; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472240; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472240>

No abstract available

*Continuous Radiation; Continuous Wave Radar; Frequencies; Synthetic Aperture Radar*

**20080000415** Naval Research Lab., Washington, DC USA

**Utility of Helicopter Rotor Reflections at HF**

Utley, Frank H; Headrick, William C; Rohlf, Derrill C; Ferrell, James T; Dec 29, 1972; 30 pp.; In English

Contract(s)/Grant(s): Proj-RF12-151-402-4007

Report No.(s): AD-A472251; NRL-7500; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472251>

Recent over-the-horizon (OTH) surveillance exercises conducted by the Naval Research Laboratory in cooperation with air and surface units of the U.S. Fleet have permitted the opportunity for detection and characterization of the rotor modulations of the SH-3D helicopter. The uniqueness of the radar signature of the SH-3D rotor blade affords adequate discrimination in an environment of multiple conventional aircraft. Such echoes have been obtained from the SH-3D at line-of-sight ranges and at approximately 870 and 2070 nautical miles from the radar. Though no extensive detection statistic has yet been accumulated, use of a ship's own helicopter for locating the ship's position within the OTH-sensor envelope has been tentatively demonstrated, as disclosed in this report.

DTIC

*Detection; Helicopters; Over-the-Horizon Radar; Radar; Radar Signatures; Rotary Wings; Targets*

**20080000436** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Rotorcraft Smoothing Via Linear Time Periodic Methods**

Schulz, Christopher S; Jul 2007; 312 pp.; In English

Report No.(s): AD-A472290; AFIT/DS/ENY/07-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472290>

This research presents the development of an on line linear time periodic rotor vibration controller. The Cramer-Rao bound is developed for a linear time periodic system in order to identify the quality of identified system parameters, which are used in system models for controller development. The methods developed in this work allow model parameters can be verified for accuracy and likewise adjusted to improve controller accuracy.

DTIC

*Flight Tests; Helicopters; Rotary Wing Aircraft; Smoothing*

**20080000542** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Assessment of Human Performance in a Simulated Rotorcraft Downwash Environment**

Wright, Nathan L; Plaga, John A; May 2007; 48 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A472273; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Operational Requirements Document (ORD) CAF 315-97-B calls for the development of a Personnel Recovery Vehicle (PRV) to be used during Combat Search and Rescue missions undertaken by the Special Operations Command. Tests were conducted in the Aerospace Vehicle Survivability Facility of the 46th Operation's Group's Munitions Test Division (46 OGM), WPAFB to determine the horizontal and vertical airflow velocity limits in which personnel can perform necessary tasks. Horizontal test profiles included subjects walking into airflow wearing representative gear and carrying a Stokes litter with a patient. Vertical tests included descending a fast rope, climbing a ladder, and hoisting a litter into the airflow. Data analysis resulted in definition of horizontal airflow velocity limits. Vertical airflow limits were not defined due to poor experimental flow conditions. Horizontal flow is the limiting factor operationally as it is much stronger than vertical flow.

DTIC

*Air Flow; Downwash; Helicopters; Human Performance; Rotary Wing Aircraft; Vertical Takeoff Aircraft*

**20080000556** Department of Defense, Arlington, VA USA

**Audit Practices for the C-17 Globemaster III Sustainment Partnership Contract**

Jolliffe, Richard B; Burton, Bruce A; Carros, Deborah L; Denegall, Tamonie D; Young, Gloria A; Evans, Chad J; Durant, LeBarron A; Christensen, Kimberly A; Johnson, Meredith H; Apr 9, 2007; 27 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000CK-0231.000

Report No.(s): AD-A472313; IG/DOD-D-2007-078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This audit was initiated in response to two Defense Hotline allegations. One allegation claimed that the C-17 program officials provided inaccurate and misleading information to the Secretary of the Air Force, leading to a misinformed decision to award the \$4.9 billion Globemaster III Sustainment Partnership contract to The Boeing Company. An additional allegation

claimed that the C-17 program officials took action to prevent the formulation of information that may have contradicted the reasonableness of the Globemaster III Sustainment Partnership negotiated price. The C-17 is a jet-powered strategic airlifter with a cabin offering large-volume capacity and a rear-loading assembly to accommodate wheeled or tracked vehicles. The aircraft was designed to airlift and airdrop loads, including armored vehicles, directly into a combat zone. It was developed by McDonnell Douglas Corporation, a wholly owned subsidiary of The Boeing Company. The Air Force reached a negotiated agreement with McDonnell Douglas Corporation to sustain the fleet of C-17 aircraft on November 25, 2003, in the amount of \$4.9 billion for FY 2004-FY 2008. However, the contract was not definitized until July 22, 2004. Prior to contract definitization, C-17 program officials took action to revalidate the negotiated contract to ensure the price was still fair and reasonable. The IG/DoD did not substantiate the allegations. However, the C-17 program officials' decision to definitize the C-17 Globemaster III Sustainment Partnership contract was based on a revalidation effort that may have produced unreliable results. In addition, C-17 contracting officials continue to exercise priced options based, in part, on the results of the revalidation effort. As a result, the Air Force may not have achieved the best price for the Government when it awarded the C-17 sustainment contract, valued at \$4.9 billion (of which \$3.2 billion was fixed-priced).

DTIC

*C-17 Aircraft; Costs; Decision Making; Government Procurement; Procedures; Transport Aircraft*

**20080000574** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Time Based Subjective Evaluations of Seated Cushion Comfort**

Pellettiere, Joseph A; Gallagher, Hilary L; Apr 2007; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A472337; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The detrimental effects of prolonged sitting during long-duration flights include deep vein thrombosis, pressure sores, and decreased awareness and performance. Oftentimes, the cushion is the only component of the seat system that can be modified to mitigate these effects. In addition, it is the cushion that has a direct connection to the seated subject, and thus directly influences his perception. Several studies were undertaken at Wright-Patterson Air Force Base (WPAFB) in Dayton, Ohio to evaluate the long term cushion comfort of a diverse population. Test times ranged from four to eight hours of sit time during each test session. Variables measured included seat interface pressure, oxygen saturation in the lower extremities, muscle fatigue along the back, a cognitive performance task, and subjective evaluations. This study investigated the effect of time on the subjective evaluations from four different studies. It was found that the subjective variables most influenced by time were center/lower back and buttocks, while the shoulder and lower leg variables had no time effect. When the subjects were asked to rate their cushion preferences, it was found that approximately six hours were necessary before the subjects opinions of the cushions no longer changed. This finding is important for tests where the Air Force evaluates cushion options for different missions that may last nine hours or longer. These results and research are relevant to the seating industry whether they are for office, transportation or industrial environments as subjective evaluations are often conducted in order to obtain the best choice for the setting. However, it is important to know before these surveys are conducted, how long a subject should sit in the seat before opinions are collected.

DTIC

*Comfort; Cushions; Evaluation; Seats; System Effectiveness*

**20080000580** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 14. HF Radar Performance at More Than One Hop**

Headrick, J M; Utley, F H; Tesauro, C B; Oct 1967; 16 pp.; In English

Report No.(s): AD-A472348; NRL-MR-1817; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Operational records of detections of aircraft and missiles at more than one-hop distances are disclosed. It has been found that these detections are not significantly different from one-hop detections although the modes are inherently less dependable. This is an interim report on a phase of the problem; work is continuing.

DTIC

*Aircraft Detection; Missile Detection; Over-the-Horizon Radar*

**20080000599** Office of the Under Secretary of Defense (Acquisitions and Technology), Washington, DC USA

**Unmanned Aircraft Systems Sensors**

Weatherington, Dyke D; May 2005; 45 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472380; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Drone Vehicles; Multisensor Fusion; Surveillance; Unmanned Aircraft Systems*

**2008000600** Naval Air Warfare Center, China Lake, CA USA

**Survey of Sensor Payloads for UAVs**

Hintz, R T; May 2005; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472381; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Drone Vehicles; Payloads; Surveys*

**2008000611** Stanford Univ., Stanford, CA USA

**High-Fidelity Multidisciplinary Design Using an Integrated Design Environment**

Jameson, Antony; Aug 14, 2007; 39 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0051

Report No.(s): AD-A472441; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main objectives of the research was to further develop the necessary fundamental algorithms to enable high fidelity multi-disciplinary design of complete aircraft configurations. The work was focused on four main areas: (1) Flow solution algorithms for unstructured meshes, (2) Aero-structural plan-form optimization, (3) Multi-fidelity approach to multi-disciplinary design of supersonic aircraft. (4) Algorithms for automatic feedback control of aerodynamic flows.

DTIC

*Algorithms; Supersonic Aircraft*

**2008000869** NASA Dryden Flight Research Center, Edwards, CA, USA

**Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908**

Bowers, Al; Cole, Jennifer Hansen; Martin, Cam; June 18, 2007; 48 pp.; In English; Gliding Experiments of the Wright Brothers: The Wrights and Flight Research 1899-1908, 18 Jun. 2007, Lancaster, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000869>

This viewgraph presentation reviews the Wright Brothers' flight research from 1899-1908.

CASI

*Gliders; Aerodynamics; Flight Tests; Histories; Wind Tunnel Tests; Aircraft Design*

**2008000955** Library of Congress, Washington, DC USA

**Unmanned Vehicles for U.S. Naval Forces: Background and Issues for Congress**

O'Rourke, Ronald; Oct 25, 2006; 7 pp.; In English

Report No.(s): AD-A472534; CRS-RS21294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472534>

Unmanned vehicles (UVs) are viewed as a key component of U.S. defense transformation. Perhaps uniquely among the military departments, the Department of the Navy (DON), which includes the Navy and Marine Corps, may eventually acquire every major kind of UV, including unmanned air vehicles (UAVs), unmanned combat air vehicles (or UCAVs, which are UAVs armed with weapons), unmanned surface vehicles (USVs), unmanned underwater vehicles (UUVs), and unmanned ground vehicles (UGVs). Navy and Marine Corps UV programs raise several potential issues for Congress. This report will be updated as events warrant.

DTIC

*Combat; Drone Vehicles; Procurement; Underwater Vehicles*

**2008000962** Library of Congress, Washington, DC USA

**Navy CVN-21 Aircraft Carrier Program: Background and Issues for Congress**

O'Rourke, Ronald; Aug 20, 2004; 7 pp.; In English

Report No.(s): AD-A472563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472563>

Current Administration plans call for procuring the Navy's next aircraft carrier, called CVN-21, in FY2007. The Navy in early 2004 estimated that CVN-21 would cost a total of about \$3.1 billion develop and \$8.6 billion to procure, for a total acquisition cost of about \$11.7 billion. Advance procurement 'down payments' on this ship have been approved by Congress each year since FY2001. On August 19, 2004, the Department of Defense (DOD) reported that the estimated development cost for a 3-ship carrier program (CVN-21 plus two sister ships to be procured years after CVN-21) had increased by \$728 million,

to \$4.33 billion. DOD now estimates that the program would have a total acquisition cost of about \$36.1 billion (\$4.33 billion for development and \$31.75 billion for procurement), or an average of about \$12 billion per ship. If much of the \$728-million increase in the estimated development cost is for the CVN-21 itself then CVN-21's estimated acquisition cost may now be more than \$12 billion. In mid-August 2004, it was reported that the Navy's draft FY2006-FY2011 shipbuilding plan would delay procurement of CVN-21 by one year, to FY2008. Based on past data for carrier construction programs, such a delay might increase the procurement cost of the ship by a few or several hundred million dollars, which could increase its total acquisition cost to well over \$12 billion, and possibly something closer to \$13 billion. This report will be updated as events warrant.

DTIC

*Aircraft Carriers; Military Aircraft; Navy; Procurement*

**20080000964** Library of Congress, Washington, DC USA

**The Air Force KC-767 Lease Proposal: Key Issues for Congress**

Bolkcom, Christopher; Aug 29, 2003; 85 pp.; In English

Report No.(s): AD-A472566; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472566>

The Air Force wishes to replace its KC-135E aircraft by leasing 100 new Boeing KC-767 tankers. The Air Force indicates that leasing is preferred because it will result in faster deliveries than outright purchasing. Air Force leaders argue that a lease will allow them to husband scarce procurement dollars by making a small down payment. Although Congress authorized the proposed lease in the FY2002 DOD Appropriations Act, it stipulated that the defense oversight committees must approve the lease - only the Senate Armed Services Committee has yet to approve. The lease proposal has been controversial and issues raised thus far include: Whether there is an urgent need to replace the KC-135 fleet. The Air Force states that replacing the KC-135 is urgent, citing high costs, aircraft vulnerability to catastrophic problems, and the imminent closing of the 767 production line. Opponents of the lease state that operating costs are controllable and will be far lower than the overall costs of leasing the 767; that the vulnerability is no more than depicted in a 2-year old study which the Air Force found acceptable; and that the 767 production line is viable until 2006-2008.

DTIC

*Government Procurement; Tanker Aircraft*

**20080000974** Library of Congress, Washington, DC USA

**Air Force FB-22 Bomber Concept**

Bolkcom, Christopher; May 26, 2004; 7 pp.; In English

Report No.(s): AD-A472583; CRS-RS21848; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472583>

The Air Force has expressed interest in developing a bomber variant of the F/A-22 Raptor to 'bridge the gap' between today's bombers and a follow-on bomber in 2037. Questions exist regarding the FB-22's feasibility, cost, and combat potential. This report will be updated as events warrant.

DTIC

*Bomber Aircraft; Combat*

**20080000977** Library of Congress, Washington, DC USA

**Potential Military Use of Airships and Aerostats**

Bolkcom, Christopher; Nov 11, 2004; 7 pp.; In English

Report No.(s): AD-A472587; CRS-RS21886; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472587>

The Department of Defense (DOD) has a history of using lighter-than-air (LTA) platforms such as airships (blimps) and aerostats (tethered balloons). Aerostats have recently been fielded to protect U.S. troops in the field. Contemporary interest is growing in using airships for numerous missions. This report examines the various concepts being considered and describes the issues for Congress. This report will be updated as events warrant.

DTIC

*Airships; System Effectiveness*

**20080000982** Library of Congress, Washington, DC USA

**Coast Guard Deepwater Program: Background and Issues for Congress**

O'Rourke, Ronald; Apr 1, 2005; 7 pp.; In English

Report No.(s): AD-A472603; CRS-RS21019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472603>

The Deepwater program is a 20- to 25-year acquisition effort to replace or modernize 93 aging Coast Guard ships and 207 aging Coast Guard aircraft. The program's estimated total acquisition cost is \$19 billion to \$24 billion. On March 25, 2005, the Coast Guard submitted to Congress a revised implementation plan for the program that alters the planned capabilities and numbers of Deepwater assets and the schedule for acquiring or modernizing them. Some Members of Congress have criticized the revised implementation plan. The Coast Guard's proposed FY2006 budget requests \$966 million for the program. This report will be updated as events warrant.

DTIC

*Budgeting; Coasts; Cost Estimates; Deep Water; Procurement; Water Depth*

**20080000983** Library of Congress, Washington, DC USA

**Coast Guard Deepwater Program: Background and Issues for Congress**

O'Rourke, Ronald; May 12, 2005; 7 pp.; In English

Report No.(s): AD-A472604; CRS-RS21019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472604>

The Deepwater program is a 20- to 25-year acquisition effort to replace or modernize 93 aging Coast Guard ships and 207 aging Coast Guard aircraft. The program's estimated total acquisition cost is \$19 billion to \$24 billion. The Coast Guard's proposed FY2006 budget requests \$966 million for the program. On March 25, 2005, the Coast Guard submitted to Congress a revised implementation plan for the program. Some Members of Congress have criticized the plan on several grounds. On May 4, 2005, the Chairman of the Homeland Security Subcommittee of the House Appropriations Committee criticized the Department of Homeland Security (DHS), the Coast Guard's parent agency, for being insufficiently responsive to the subcommittee's requests for comprehensive information on the Deepwater program. Because of this, the subcommittee recommended reducing the program's FY2006 funding request to \$500 million. The FY2006 DHS appropriations bill as reported by the House Appropriations Committee on May 10, 2005, includes this recommended reduction. This report will be updated as events warrant.

DTIC

*Budgeting; Coasts; Cost Estimates; Deep Water; Procurement; Water Depth*

**20080000984** Library of Congress, Washington, DC USA

**Coast Guard Deepwater Program: Background and Issues for Congress**

O'Rourke, Ronald; May 19, 2005; 7 pp.; In English

Report No.(s): AD-A472605; CRS-RS21019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472605>

The Deepwater program is a 20- to 25-year acquisition effort to replace or modernize 93 aging Coast Guard ships and 207 aging Coast Guard aircraft. The Coast Guard's proposed FY2006 budget requests \$966 million for the program. On March 25, 2005, the Coast Guard submitted to Congress a revised implementation plan for the program. Some Members of Congress have criticized the plan on several grounds. On May 17, 2005, the House passed, 424-1, H.R. 2360, the FY2006 Department of Homeland Security (DHS) appropriations bill. The bill reduces the Deepwater funding request to \$500 million. This report will be updated as events warrant.

DTIC

*Budgeting; Coasts; Cost Estimates; Deep Water; Procurement; Water Depth*

**20080000985** Library of Congress, Washington, DC USA

**Coast Guard Deepwater Program: Background and Issues for Congress**

O'Rourke, Ronald; Jun 28, 2005; 7 pp.; In English

Report No.(s): AD-A472606; CRS-RS21019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472606>

The Deepwater program is a 20- to 25-year, \$19- to \$24-billion acquisition program to replace or modernize 93 Coast Guard ships and 207 Coast Guard aircraft. The Coast Guard's FY2006 budget requests \$966 million for the program. On



March 25, 2005, the Coast Guard submitted to Congress a revised implementation plan for the program. Some Members of Congress have criticized the plan on several grounds. The House version of H.R. 2360, the FY2006 Department of Homeland Security (DHS) appropriations bill, reduces the FY2006 Deepwater funding request to \$500 million; the Senate version reduces it to \$905.6 million. This report will be updated as events warrant.

DTIC

*Budgeting; Coasts; Cost Estimates; Deep Water; Procurement; Water Depth*

**20080001010** Library of Congress, Washington, DC USA

**Coast Guard Deepwater Program: Background, Oversight Issues, and Options for Congress**

O'Rourke, Ronald; Dec 22, 2006; 25 pp.; In English

Report No.(s): AD-A472650; CRS-RL33753; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472650>

The Integrated Deepwater Systems (ID S) program, or Deepwater program for short, is a \$24-billion, 25-year project to replace and modernize the Coast Guard's aging fleet of deepwater-capable ships and aircraft. It is the largest and most complex acquisition effort in Coast Guard history, encompassing 91 new cutters, 124 new small surface craft, and 244 new or converted airplanes, helicopters, and unmanned aerial vehicles (UAVs). The issue for Congress is whether to approve, reject, or modify the Administration's annual funding requests and overall approach for the program.

DTIC

*Coasts; Deep Water; Water Depth*

**20080001011** Library of Congress, Washington, DC USA

**Potential F-22 Raptor Export to Japan**

Bolkcom, Christopher; Chanlett-Avery, Emma; Jun 28, 2007; 7 pp.; In English

Report No.(s): AD-A472652; CRS-RS22684; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472652>

Japan has expressed interest in purchasing the F-22A Raptor aircraft from the USA. Although the export of the plane is now prohibited by U.S. law, Congress has recently and may again consider repealing this ban. Arguments for the sale include potential benefits to U.S. industry, contribution to the defense of Japan and the region, and promotion of U.S. interoperability with the Japanese military. Arguments against the transfer include concerns about technology proliferation and the potential for undermining regional stability. This report will be updated as warranted.

DTIC

*Fighter Aircraft; International Trade; Japan*

**20080001136** Library of Congress, Washington, DC USA

**Joint Strike Fighter (JSF) Program: Background, Status, and Issues**

Bolkcom, Christopher; Jan 11, 2002; 27 pp.; In English

Report No.(s): AD-A472769; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Department's (DoD) Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current debate over tactical aviation, the others being the Air Force F-22 fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the DoD selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. On October 26, 2001, the Lockheed Martin team was selected to develop further and to produce a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the U.K. Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century. The JAST/JSF program evolved in response to the high cost of tactical aviation, the need to deploy fewer types of aircraft to reduce acquisition and operating costs, and current projections of future threat scenarios and enemy capabilities. The program's rationale and primary emphasis is joint-service development of a next-generation multi-role aircraft that can be produced in affordable variants to meet different operational requirements. Developing an affordable tri-service family of CTOL and STOVL aircraft with different combat missions poses major technological challenges. Moreover, if the JSF is to have joint-service support, the program must yield affordable aircraft that can meet such divergent needs as those of the U.S. Air Force, the U.S. Marine Corps, the U.K. Royal Navy, and

the U.S. Navy. This report discusses the background, status, and current issues of the JSF program.

DTIC

*Cost Estimates; Government Procurement; Management Planning; Military Operations; Procurement*

**20080001137** Library of Congress, Washington, DC USA

**Joint Strike Fighter (JSF) Program: Background, Status, and Issues**

Bolkcom, Christopher; Feb 15, 2002; 27 pp.; In English

Report No.(s): AD-A472770; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Department's (DoD) Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current debate over tactical aviation, the others being the Air Force F-22 fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the DoD selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. On October 26, 2001, the Lockheed Martin team was selected to develop further and to produce a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the U.K. Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century. The JAST/JSF program evolved in response to the high cost of tactical aviation, the need to deploy fewer types of aircraft to reduce acquisition and operating costs, and current projections of future threat scenarios and enemy capabilities. The program's rationale and primary emphasis is joint-service development of a next-generation multi-role aircraft that can be produced in affordable variants to meet different operational requirements. Developing an affordable tri-service family of CTOL and STOVL aircraft with different combat missions poses major technological challenges. Moreover, if the JSF is to have joint-service support, the program must yield affordable aircraft that can meet such divergent needs as those of the U.S. Air Force, the U.S. Marine Corps, the U.K. Royal Navy, and the U.S. Navy. This report discusses the background, status, and current issues of the JSF program.

DTIC

*Cost Estimates; Government Procurement; Management Planning; Military Operations; Procurement*

**20080001138** Library of Congress, Washington, DC USA

**Joint Strike Fighter (JSF) Program: Background, Status, and Issues**

Bolkcom, Christopher; Jul 18, 2002; 28 pp.; In English

Report No.(s): AD-A472771; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Department's (DoD) Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current debate over tactical aviation, the others being the Air Force F-22 fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the DoD selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. On October 26, 2001, the Lockheed Martin team was selected to develop further and to produce a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the U.K. Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century. The JAST/JSF program evolved in response to the high cost of tactical aviation, the need to deploy fewer types of aircraft to reduce acquisition and operating costs, and current projections of future threat scenarios and enemy capabilities. The program's rationale and primary emphasis is joint-service development of a next-generation multi-role aircraft that can be produced in affordable variants to meet different operational requirements. Developing an affordable tri-service family of CTOL and STOVL aircraft with different combat missions poses major technological challenges. Moreover, if the JSF is to have joint-service support, the program must yield affordable aircraft that can meet such divergent needs as those of the U.S. Air Force, the U.S. Marine Corps, the U.K. Royal Navy, and the U.S. Navy. This report discusses the background, status, and current issues of the JSF program.

DTIC

*Cost Estimates; Government Procurement; Management Planning; Military Operations; Procurement*

**20080001139** Library of Congress, Washington, DC USA

**Joint Strike Fighter (JSF) Program: Background, Status, and Issues**

Bolkcom, Christopher; Feb 5, 2003; 28 pp.; In English

Report No.(s): AD-A472772; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Department's (DoD) Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current

debate over tactical aviation, the others being the Air Force F-22 fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the DoD selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. On October 26, 2001, the Lockheed Martin team was selected to develop further and to produce a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the U.K. Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century. The JAST/JSF program evolved in response to the high cost of tactical aviation, the need to deploy fewer types of aircraft to reduce acquisition and operating costs, and current projections of future threat scenarios and enemy capabilities. The program's rationale and primary emphasis is joint-service development of a next-generation multi-role aircraft that can be produced in affordable variants to meet different operational requirements. Developing an affordable tri-service family of CTOL and STOVL aircraft with different combat missions poses major technological challenges. Moreover, if the JSF is to have joint-service support, the program must yield affordable aircraft that can meet such divergent needs as those of the U.S. Air Force, the U.S. Marine Corps, the U.K. Royal Navy, and the U.S. Navy. This report discusses the background, status, and current issues of the JSF program.

DTIC

*Cost Estimates; Government Procurement; Management Planning; Military Operations; Procurement*

**20080001140** Library of Congress, Washington, DC USA

**Joint Strike Fighter (JSF) Program: Background, Status, and Issues**

Bolkcom, Christopher; Jun 16, 2003; 31 pp.; In English

Report No.(s): AD-A472773; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Department's (DoD) Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current debate over tactical aviation, the others being the Air Force F-22 fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the DoD selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. On October 26, 2001, the Lockheed Martin team was selected to develop further and to produce a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the U.K. Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century. The JAST/JSF program evolved in response to the high cost of tactical aviation, the need to deploy fewer types of aircraft to reduce acquisition and operating costs, and current projections of future threat scenarios and enemy capabilities. The program's rationale and primary emphasis is joint-service development of a next-generation multi-role aircraft that can be produced in affordable variants to meet different operational requirements. Developing an affordable tri-service family of CTOL and STOVL aircraft with different combat missions poses major technological challenges. Moreover, if the JSF is to have joint-service support, the program must yield affordable aircraft that can meet such divergent needs as those of the U.S. Air Force, the U.S. Marine Corps, the U.K. Royal Navy, and the U.S. Navy. This report discusses the background, status, and current issues of the JSF program.

DTIC

*Cost Estimates; Government Procurement; Management Planning; Military Operations; Procurement*

**20080001141** Library of Congress, Washington, DC USA

**Joint Strike Fighter (JSF) Program: Background, Status, and Issues**

Bolkcom, Christopher; Jul 11, 2003; 31 pp.; In English

Report No.(s): AD-A472774; CRS-RL30563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Department's (DoD) Joint Strike Fighter (JSF) is one of three aircraft programs at the center of current debate over tactical aviation, the others being the Air Force F-22 fighter and the Navy F/A-18E/F fighter/attack plane. In November 1996, the DoD selected two major aerospace companies, Boeing and Lockheed Martin, to demonstrate competing designs for the JSF, a joint-service and multi-role fighter/attack plane. On October 26, 2001, the Lockheed Martin team was selected to develop further and to produce a family of conventional take-off and landing (CTOL), carrier-capable (CV), and short take-off vertical landing (STOVL) aircraft for the U.S. Air Force, Navy, and Marine Corps and the U.K. Royal Navy as well as other allied services. Originally designated the Joint Advanced Strike Technology (JAST) program, the JSF program is a major issue in Congress because of concerns about its cost and budgetary impact, effects on the defense industrial base, and implications for U.S. national security in the early 21st century. The JAST/JSF program evolved in response to the high

cost of tactical aviation, the need to deploy fewer types of aircraft to reduce acquisition and operating costs, and current projections of future threat scenarios and enemy capabilities. The program's rationale and primary emphasis is joint-service development of a next-generation multi-role aircraft that can be produced in affordable variants to meet different operational requirements. Developing an affordable tri-service family of CTOL and STOVL aircraft with different combat missions poses major technological challenges. Moreover, if the JSF is to have joint-service support, the program must yield affordable aircraft that can meet such divergent needs as those of the U.S. Air Force, the U.S. Marine Corps, the U.K. Royal Navy, and the U.S. Navy. This report discusses the background, status, and current issues of the JSF program.

DTIC

*Cost Estimates; Government Procurement; Management Planning; Military Operations; Procurement*

**20080001166** Library of Congress, Washington, DC USA

**Military Airlift: C-17 Aircraft Program**

Bolkcom, Christopher; Oct 17, 2000; 19 pp.; In English

Report No.(s): AD-A472850; CRS-RL30685; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The C-17 Globemaster III is a long-range cargo/transport aircraft operated by the U.S. Air Force since 1993. Congress approved development of the aircraft in the late 1970s, when it was recognized that the Air Force did not have enough airlift capability. In 1981, the McDonnell Douglas C-17 emerged as winner of a competition with Boeing and Lockheed to develop a next-generation aircraft to replace C-130s and C-141s. Full-scale development of the C-17 got underway in 1986, but technical problems and funding shortfalls delayed the program, leading to slipped schedules and increased costs. Despite those difficulties, the C-17 has retained broad congressional support and enjoys strong Air Force and Army backing. Defense officials view the C-17 as essential in the post-Cold War environment, because of its ability to use smaller bases in remote areas. The C-17 first flew in 1991, about a year later than originally scheduled. Deliveries began in 1993, and in January 1995 the Air Force declared the aircraft fully operational. By January 2000, the Air Force had taken delivery of 57 C-17s, some of which were successfully used in Bosnia and later in Kosovo operations. Production problems in the late 1980s raised questions about the possibility of more cost-effective alternatives. In April 1990, Defense Secretary Cheney reduced the projected buy from 210 to 120 planes. In late 1993, DOD gave the contractor two years to solve production problems or face termination of the contract, with airlift shortfalls to be filled by modified commercial transport planes or existing military airlifters. By the mid-1990s, the program's earlier difficulties had been largely resolved, although some questioned the number of C-17s to be procured. In 1996 DOD approved plans to order 80 more C-17s for a total of 120 aircraft increased in late 1998 to 134.

DTIC

*C-17 Aircraft; Costs; Transport Aircraft*

**20080001167** Library of Congress, Washington, DC USA

**F/A-22 Raptor**

Bolkcom, Christopher; Jan 6, 2005; 28 pp.; In English

Report No.(s): AD-A472858; CRS-RL31673; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The F/A-22 Raptor is a next-generation fighter/attack aircraft that features the latest stealth technology to reduce detection by radar. Using more advanced engines and avionics than the current F-15 Eagle, the F/A-22 is intended to maintain U.S. Air Force capabilities against more sophisticated aircraft and missiles in the 21st century. This report examines the Air Force's F/A-22 Raptor program, including costs and schedule; considers several key issues, and concludes with a synopsis of recent legislative activity the program.

DTIC

*Attack Aircraft; Fighter Aircraft*

**20080001399** Air Force Test Pilot School, Edwards AFB, CA USA

**F-16B Pacer Aircraft Trailing Cone Length Extension Tube Investigative Study (HAVE CLETIS)**

Welser, Michael E; Hoenle, Darin L; Iyer, Swami B; Chua, Yeu-Fong; Reinhardt, Carrie A; Jutte, Andrew J; Jun 2007; 91 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472153; AFFTC-TIM-07-02; XC-412/TW; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472153>

This USAF Test Pilot School Test Management Project report presents the results of an investigation of trailing cone

flying qualities and calibration of an F-16B pacer aircraft equipped with fixed-length trailing cone systems of different lengths.  
DTIC

*Fighter Aircraft; F-16 Aircraft; Flight Tests; Test Pilots*

**20080001479** Army Aeromedical Research Lab., Fort Rucker, AL USA

**A Physiological and Human Factors Evaluation of a Novel Personal Helicopter Oxygen Delivery System**

Curry, Ian P; Roller, Richard A; Sep 2007; 49 pp.; In English

Report No.(s): AD-A472633; USAARL-2007-14; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472633>

In current U.S. Army operations, rotary-wing aircrew can be repeatedly exposed to moderately high altitude (up to 18,000 feet pressure altitude), making hypoxia, and its performance effects, a real hazard. The USA Army Aeromedical Research Laboratory (USAARL) was tasked by the Product Manager Air Warrior to evaluate a portable oxygen system for potential use by U.S. Army helicopter aircrew. The system described below provided capability for oxygen production, charging of the portable system, as well as in-flight use by aircrew. The system was tested for its compatibility with current Aircrew Assemblies, Night Vision Goggles, aircrew duties, and emergency egress. The system was also tested on pilot volunteers at altitude to determine efficacy. The Personal Helicopter Oxygen Delivery System (PHODS) was able to maintain aircrew blood oxygen at acceptable levels up to and including 18,000 feet.

DTIC

*Flight Crews; Helicopters; Human Factors Engineering; Oxygen; Oxygen Supply Equipment; Physiological Factors*

**20080001566** NASA Dryden Flight Research Center, Edwards, CA, USA

**G-III Precision Autopilot Development in Support of UAVSAR Program**

Lee, James; Strovers, Brian; Lin, Victor; October 25, 2007; 35 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001566>

The primary objective of the UAVSAR Project is to develop a miniaturized polarimetric L-band synthetic aperture radar (SAR) for use on an unmanned aerial vehicle (UAV) or minimally piloted vehicle. Five Cycle 1 precision autopilot flights have been completed as of May 14, 2007. The first flight was open-loop controller, the second, third, fourth, and fifth flights were closed loop. The fifth flight demonstrated increasing duration within ten meter tube (approximately 90% of the time in the ten meter tube over a 200km course).

Derived from text

*Automatic Pilots; Pilotless Aircraft; Synthetic Aperture Radar; Feedback Control; Polarimetry; Controllers*

**20080001620** Defence Research and Development Canada, Toronto, Ontario Canada

**Fighter Pilot Cognitive Effectiveness During Exercise Wolf Safari**

Paul, Michel A; Gray, Gary W; Miller, James C; Feb 2007; 42 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472968; DRDC-TORONTO-TR-2007-020; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472968>

On recommendations from 1 Canadian Air Division surgeon, DRDC Toronto received a tasking from 4 Wing to develop models of cognitive effectiveness of CF-18 pilots during Exercise Wolf Safari (an 'around the clock' air-to-ground bombing exercise prior to possible deployment of CF-18 aircraft to support the troops in Afghanistan). During work-ups prior to Wolf Safari as well as during the exercise, six CF-18 pilots wore wrist actigraphs for up to 28 days to allow quantification of their daily sleep. Their daily duty times and daily sleep data were inputted to FAST (Trademark) (Fatigue Avoidance Scheduling Tool) to generate models of cognitive assessment for each of the participating pilots. Four of the six pilots showed that the Wolf Safari Op Tempo caused a fatigued-induced impact on modelled cognitive effectiveness similar to or worse than the impact caused by being intoxicated to a blood alcohol level of 0.08%. The remaining two pilots showed a moderate impact on cognitive effectiveness. Some degradation in cognitive effectiveness is inevitable during stressful and complex military operations, especially when conducted at night. To some extent, these performance degradations can be mitigated by ensuring the best possible opportunities for sleep, by sustaining nocturnal alertness with caffeinated gum, and by exploiting the new CF aeromedical policy for the short-term flight supervised prescription of selected sleep-inducing medications.

DTIC

*Cognition; Fighter Aircraft; Jet Aircraft; Night; Physical Exercise; Pilots; Wolves*

**20080001621** Defense Science Board, Washington, DC USA

**Defense Science Board Task Force on Future Need for VTOL/STOL Aircraft**

Howard, Jr , William G; Pilling, Donald L; Jul 2007; 162 pp.; In English

Report No.(s): AD-A473069; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473069>

Since the start of the global war on terrorism, many operations involving U.S. forces have been supported by helicopters, to include combat operations, counterinsurgency operations, security operations, disaster relief, and humanitarian assistance operations. But in many cases, rotary wing aircraft have not been well suited to the mission. In fact, helicopter-related losses are among the leading causes of fatalities in operations in Afghanistan and Iraq. In consideration of these facts, this task force was convened to address the features and capabilities that vertical take-off and landing (VTOL) and short take-off and landing (STOL) aircraft should have in order to contribute to the nation's security needs into the 21st century. As a basis for its assessment, the task force evaluated the lift requirements to support the Army's current concept for distributed ground combat-mounted aerial maneuver-the centerpiece of which is the Future Combat System (FCS). The success of this concept depends on the ability to lift troops, equipment, and supplies from an intermediate staging base, located either on land or at sea, to battlefield enclaves that could be in unimproved, primitive locales. The conclusion reached by the task force is that mounted aerial maneuver with current FCS forces strains airlift technology and operations. Suitable aircraft and supporting ships, while technically possible, will be costly, technically risky, and take a long time to field. The bottom line of this study is this: there are airlift solutions to distributed, long-distance combat. But the costs and benefits, according to the proposed operational requirements, should be carefully examined and alternative concepts explored to achieve the same results at lower risk and cost.

DTIC

*Cost Analysis; Cost Effectiveness; Rotary Wing Aircraft; Short Takeoff Aircraft; Vertical Landing; Vertical Takeoff; Vertical Takeoff Aircraft*

**20080001649** Congressional Budget Office, Washington, DC USA

**Issues Regarding the Current and Future Use of the Civil Reserve Air Fleet**

Oct 2007; 15 pp.; In English

Report No.(s): AD-A473110; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473110>

To support military operations in Afghanistan and Iraq, the Department of Defense (DoD) has made substantial use of commercial air transportation provided by carriers that participate in the Civil Reserve Air Fleet (CRAF) program. Over the 2002-2006 period, DoD's total expenditures for airlift services provided by CRAF carriers averaged about \$2.1 billion annually, a nearly fourfold increase over the average during the previous five years. Carriers that participate in the CRAF program are eligible to receive that business from DoD in exchange for making their aircraft and air crews available on short notice to support rapid, large-scale deployments of military forces. DoD is anticipating a substantial decrease in the need for commercial airlift services when operations in the Middle East ultimately wind down. To maintain carriers' incentives to participate in the CRAF program, DoD submitted a proposal as part of its fiscal year 2008 budget request that would allow it to guarantee CRAF carriers more business at the beginning of a fiscal year than it is currently authorized to guarantee.

DTIC

*Air Transportation; Civil Aviation; Commercial Aircraft*

**20080001654** General Accounting Office, Washington, DC USA

**Close Air Support: Status of the Air Force's Efforts to Replace the A-10 Aircraft**

Sep 1988; 41 pp.; In English

Report No.(s): AD-A473121; GAO/NSIAD-88-211; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473121>

The Department of Defense is considering replacement options for the Air Force's primary close air support aircraft, the A-10. The Air Force is concerned about the A-10's ability to support the Army and survive the Soviet air defense threat of the 1990s and beyond. The Congress may soon face some major funding decisions on the A-10 replacement. The Chairman of the House Committee on Armed Services asked GAO to identify close air support requirements and review the Air Force's plans to replace or upgrade its close support aircraft, the A-10 and the A-7. This report addresses the A-10 replacement; the A-7 upgrade is addressed in a separate report. GAO discusses these efforts in separate reports because the issues associated with each are sufficiently different and significant.

DTIC

*A-10 Aircraft; Attack Aircraft; Conditions; Hazards; Support Systems*

**20080001869** Defence Science Technology Lab., Farnborough, UK

**Human Automation Integration for Supervisory Control of UAVs**

Taylor, Robert M; Jun 2006; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473313; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Automatic Control; Drone Vehicles; Human Factors Engineering; Pilotless Aircraft; Remote Control*

**20080001874** Naval Postgraduate School, Monterey, CA USA

**An Alternative Optimization Model and Robust Experimental Design for the Assignment Scheduling Capability for Unmanned Aerial Vehicles (ASC-U) Simulation**

Oliver, Derek M; Jun 2007; 117 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473318; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Modeling, Virtual Environments, and Simulations Institute (MOVES) and the USA Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) at the Naval Postgraduate School, Monterey, California, developed the Assignment Scheduling Capability for Unmanned Aerial Vehicles (ASC-U) discrete event simulation to aid in the analysis of future U.S. Army Unmanned Aerial Vehicle (UAV) requirements. TRAC selected ASC-U to provide insight into the programmatic decisions addressed in the U.S. Army UAV-Mix Analysis that directly affects future development and fielding of UAVs to include the Future Combat System. ASC-U employs a discrete event simulation coupled with the optimization of a linear objective function. At regular intervals, ASC-U obtains an optimal solution to an assignment problem that assigns UAVs to mission requirements that are available or will be available at some time in the future. This thesis presents an alternative optimization model, explores 23 simulation factors, and provides sensitivity analysis for how UAV coverage may degrade in the presence of adverse random events. Integer programming, experimental design, and an innovative Optimized Flexible Latin Hypercube (OFLH) design are used to evaluate a representative sample from an Army 2018 scenario. The conclusions suggest the following: the alternative optimization model developed in this thesis can successfully maximize ASC-U value without the use of a heuristic; Smaller Optimization Intervals do not guarantee higher total value when the heuristics are included; to maximize total value, Early Return should be set to FALSE and Secondary Areas should be set to TRUE; an OFLH is valuable for robust analysis of simulation models containing many factors; and as the model factors change over predefined ranges, the solution quality is consistent.

DTIC

*Computerized Simulation; Experiment Design; Models; Pilotless Aircraft; Remotely Piloted Vehicles; Scheduling; Simulation*

**20080001879** Systems Technology, Inc., Hawthorne, CA USA

**Helicopter Aircrew Training Using Fused Reality**

Bachelder, Ed; Jun 2006; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473323; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Flight Crews; Helicopters; Virtual Reality*

**20080001906** Naval Postgraduate School, Monterey, CA USA

**Real-Time Implementation of an Asynchronous Vision-Based Target Tracking System for an Unmanned Aerial Vehicle**

Schenk, Michael A; Jun 2007; 157 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473354; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Currently, small unmanned aerial vehicles developed by NPS have been able to locate and track stationary and moving targets on the ground. New methods of continuous target tracking are always being developed to improve speed and accuracy, ultimately aiding the user of the system. This thesis describes one such method, utilizing an open loop filter as well as an external correction source: Perspective View Nascent Technologies (PVNT). While the PVNT correction can theoretically improve the accuracy from 20-30 meters to 1-2 meters, it does have a disadvantage in that the target position updates are delayed anywhere from 1 - 10 seconds. In order to account for the delay, an asynchronous filter is used to update the target position data given the external position correction from PVNT. Two cases have been tested including the general filter and one that utilizes a road model in the calculations. While an earlier thesis developed the basic simulation for the system, this thesis discusses improvements and corrections to the simulation model as well as the necessary steps for real-time implementation.

DTIC

*Detection; Drone Vehicles; Pilotless Aircraft; Real Time Operation; Synchronism; Target Acquisition; Tracking (Position)*

**20080001949** RAND Corp., Santa Monica, CA USA

**F-22A Multiyear Procurement Program. An Assessment of Cost Savings**

Younossi, Obaid; Arena, Mark V; Brancato, Kevin; Graser, John C; Goldsmith, Benjamin W; Lorell, Mark A; Timson, Fred; Sollinger, Jerry M; Jan 2007; 172 pp.; In English

Contract(s)/Grant(s): W74V8H-06-0002

Report No.(s): AD-A473439; RAND/MG-664-OSD; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Buying defense weapon systems under multiyear contracts rather than a series of single-year contracts can save costs because contractors can buy materials in more economic quantities, schedule workers and facilities more efficiently, and reduce the burden of preparing multiple proposals. The U.S. Air Force is in the process of awarding multiyear contracts for 60 F-22A aircraft over three years. Congress wants to assure itself that the proposed contract will yield the promised savings and asked RAND for an independent review of the estimated savings. Researchers found that a multiyear procurement of three lots of F-22A fighters would save an estimated \$411 million-about 4.5 percent of the total contract value. They were able to trace 70 percent of the \$411 million to substantiated savings estimates identified by the contractors. Examining the issue of multiyear savings using several approaches produces a consistent range of results, indicating that the savings attributed to the multiyear contract by the contractors appear to be reasonable.

DTIC

*Amount; Cost Reduction; Costs; Fighter Aircraft; Government Procurement; Procurement*

**20080002098** NASA Langley Research Center, Hampton, VA, USA

**Advancements in Aircraft Model Force and Attitude Instrumentation by Integrating Statistical Methods**

Parker, Peter A.; Finley, Tom D.; [2007]; 29 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): 478076.07.01

Report No.(s): LAR-16020; No Copyright; Avail.: Other Sources

In the production of a high-quality measurement system, the criticality of the calibration phase is evidenced by a significant investment of resources. Applying statistical methods in tandem with instrumentation expertise has resulted in a dramatic reduction in calibration time and expense, while simultaneously improving the calibration quality. Specifically, in this paper, the foundational principles of response surface methodology and statistical quality control are presented with application to calibration. In addition, we report on the benefits that have been achieved by the integration of the experimental design with the mechanical calibration system. To demonstrate this systems engineering approach, we consider the calibration of two quintessential instruments used in aeronautical wind tunnel experiments, namely the force-balance and triaxial accelerometer measurement system. For both instruments, we discuss the development of an experimental design that accommodates physics-based constraints and highlight an innovative calibration apparatus that provides an increase in calibration efficiency. As a direct result of increased efficiency, the frequency of calibration can be increased, enabling the monitoring of instrument stability over time. Throughout the calibration process, we emphasize the efficient allocation of experimental resources to achieve the calibration requirements.

Author

*Attitude (Inclination); Statistical Analysis; Aircraft Models; Wind Tunnel Tests; Experiment Design; Force Distribution*

**20080002128** Army Research Lab., Fort Huachuca, AZ, USA

**Understanding Soldier Robot Teams in Virtual Environments**

Barnes, Michael J; Jentsch, Florian; Cosenzo, Keryl A; Chen, Jessie Y; McDermott, Patricia; Jun 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473312; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Drone Vehicles; Military Personnel; Robots; Virtual Reality*

**20080002133** Anteon Corp., Arlington, VA USA

**2007-2008 Weapon Systems**

Jan 2007; 313 pp.; In English

Report No.(s): AD-A473205; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473205>

The weapon systems and equipment described in this reference book represent an essential aspect of our commitment to the security of the nation, the preparedness of the Soldier, and the readiness of the Army. We serve the Soldier, the centerpiece



of our combat systems. Our Soldiers are critical to an Army that is serving the nation at war; more than 268,000 troops are answering the Call to Duty in more than 120 countries worldwide, and they stand ready to fulfill all current missions, including homeland security. The Army is investing in recapitalizing and modernizing the Current Force to ensure continuing Army dominance in the face of emerging threats. New capabilities have been fielded to support current operations. New efforts are getting equipment to our Soldiers faster than ever. We are maintaining readiness and improving the capabilities of units returning from and preparing for deployment. In addition, the Army continues to develop the Future Combat Systems (FCS) initiative, which represents the Army's first full-spectrum modernization in nearly 40 years. When fully operational, FCS will provide the Army and the joint force with unprecedented capability to see the enemy, engage him on our terms, and defeat him on the 21st century battlefield. FCS will become the face of the Future Force. The following pages describe our investments in the successful acquisition and sustainment of weapon systems and equipment. As you use this informative resource, however, remember that even the most technologically advanced platforms are useless without the skill and dedication of the American Soldier. Working with Congress, we will strive to provide our Soldiers with the best possible equipment so that our Army will be ready to meet today's requirements and tomorrow's challenges.

DTIC

*Combat; Government Procurement; Weapon Systems*

**20080002155** Defence Science and Technology Organisation, Edinburgh, Australia

**Enhanced Position Location Reporting System (EPLRS) Positioning Capability**

Fielke, Gary; Jun 2007; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473252; DSTO-TN-0762; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Enhanced Position Location Reporting System (EPLRS) is a network of wireless tactical radios that distributes digital data between many mobile users. In addition, EPLRS has a position reporting capability allowing mobile users to determine their position based on time difference of arrival measurements from multiple reference radio units. EPLRS has the potential to be used in Unmanned Aerial Vehicles as a navigation system backup to GPS. This report details a number of EPLRS position tests conducted at DSTO Edinburgh and the outcome of these tests with a view to UAV usage.

DTIC

*Data Transmission; Digital Systems; Position (Location); Position Sensing; Positioning; Wireless Communication*

**20080002203** NASA Dryden Flight Research Center, Edwards, CA, USA

**The Wright Brothers and the Future of Bio-Inspired Flight: 1899 through to the Future**

Bowers, Albion; November 28, 2007; 85 pp.; In English; North Carolina State University, 28 Nov. 2007, Raleigh, NC, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002203>

This viewgraph presentation reviews the experiments that the Wright Brothers conducted prior to their first powered flight in 1903 to developing the first practical aircraft in 1905. Many pictures of the gliders and other devices are used to illustrate the gradual development and experimentation that proceeded the first powered flight.

CASI

*Gliders; Flight Vehicles; Flight Tests; Aircraft Maneuvers*

**20080002273** NASA Glenn Research Center, Cleveland, OH, USA

**An Updated Assessment of NASA Ultra-Efficient Engine Technologies**

Tong Michael T.; Jones, Scott M.; September 04, 2005; 8 pp.; In English; 17th International Symposium on Airbreathing Engines, 4-9 Sep. 2006, Munich, Germany; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 22-062-10-01

Report No.(s): ISABE-2005-1163; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002273>

NASA's Ultra Efficient Engine Technology (UEET) project features advanced aeropropulsion technologies that include highly loaded turbomachinery, an advanced low-NOx combustor, high-temperature materials, and advanced fan containment technology. A probabilistic system assessment is performed to evaluate the impact of these technologies on aircraft CO<sub>2</sub> (or equivalent fuel burn) and NO<sub>x</sub> reductions. A 300-passenger aircraft, with two 396-kN thrust (85,000-lb) engines is chosen for the study. The results show that a large subsonic aircraft equipped with the current UEET technology portfolio has very high probabilities of meeting the UEET minimum success criteria for CO<sub>2</sub> reduction (-12% from the baseline) and LTO (landing

and takeoff) NOx reductions (-65% relative to the 1996 International Civil Aviation Organization rule).

Author

*Aircraft Engines; Air Quality; Pollution Control*

**20080002407** Illinois Univ., Urbana, IL USA

**Midwest Structural Sciences Center: 2006-2007 Annual Report**

Dick, William A; Paulino, Glaucio H; Jun 2007; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-06-2-3620; Proj-A02D

Report No.(s): AD-A473590; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473590>

The Midwest Structural Sciences Center (MSSC) is a collaboration between the Structural Sciences Center, Air Vehicles Directorate of the Air Force Research Laboratory (AFRL/VA SSC), and a team of faculty, graduate students, and professional staff researchers of the University of Illinois at Urbana-Champaign (UI). The team works closely to simulate, model, test, and assess structures and materials for use in future air- and space-frames in a risk-quantified design process. The MSSC is conducting research on aerothermostructures with a five to ten year horizon in four key areas: coupled thermo-mechanical-acoustic analysis and simulation, identification and definition of structural limit states, risk-quantified structural assessment, and experimental capabilities for validation of structural models.

DTIC

*Aerothermodynamics; Evaluation; Structural Engineering; System Effectiveness*

**20080002555** General Dynamics Advanced Information Systems, Dayton, OH USA

**Dynamic Characteristics and Human Perception of Vibration Aboard a Military Propeller Aircraft**

Smith, Suzanne D; Jurcsisn, Jenny G; Walker, Anne Y; Smith, Jeanne A; Bowden, David R; Sep 2007; 37 pp.; In English

Contract(s)/Grant(s): FA8650-04-D-6472; Proj-7184

Report No.(s): AD-A473700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The dynamic characteristics and human perception of higher frequency multi-axis vibration associated with a military propeller aircraft environment were investigated. Triaxial accelerations were measured at the interfaces between the occupant and aircraft seat surface (seat pan and seat back) to evaluate and compare the effects of the aircraft seat fitted with different cushions. While all cushions showed a significant reduction in the X-axis seat pan vibration as compared to the original operational seat cushion at the blade passage frequency (BPF~73.5 Hz), the associated accelerations remained significantly higher than the floor input accelerations. Transmissibility data confirmed these seat system characteristics at higher frequencies. A body region perception survey suggested that the subjects were most sensitive to the BPF component of the operational exposure in contrast to the results for the weighted acceleration levels (ISO 2631-1: 1997). Effective multi-axis vibration mitigation strategies depend on the relationships between the location, direction, magnitude, and frequency of vibration entering the occupant and human perception of the exposure. Current human exposure guidelines may not optimally reflect these relationships for assessing higher frequency propeller aircraft work environments.

DTIC

*Dynamic Characteristics; Human Body; Propellers; Vibration*

**20080002559** Sydney Univ., Australia

**Predictive Control for a Tail-Sitter UAV. Part 2**

Stone, Hugh; Anderson, Peter; Gibbens, Peter; Dec 12, 2006; 14 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0563

Report No.(s): AD-A473707; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report covers a research project to develop a quasi non-linear model predictive control algorithm for a tail-sitter UAV.

DTIC

*Aircraft Control; Drone Vehicles; Hovering; Pilotless Aircraft; Predictions*

**20080002616** Defence Science and Technology Organisation, Victoria, Australia

**Wireless Networks: Implications for Aircraft Loads Monitoring**

Knight, Chris G; May 2007; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473789; DSTO-TN-0759; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A variety of new wireless technologies offer some advantages when used for direct strain monitoring of rotating

components, particularly for rotary wing aircraft. This technical note investigates some of these technologies, including one developed in house by Air Vehicles Division. The use of wireless technology is advantageous as it avoids the use of slip rings and other current methods for monitoring strain where the component to be investigated rotates relative to the rest of the vehicle. Investigation of these same technologies for use when retrofitted to fixed wing aircraft or in non-rotating components is also presented. In this situation the advantage offered by these devices is the simplicity, convenience and speed with which they can be applied to usage and loads assessment. It is concluded that DSTO should adopt wireless sensors for an array of load monitoring uses and actively research in leading areas such as power harvesting.

DTIC

*Communication Networks; Helicopters; Loads (Forces); Wireless Communication*

**20080002626** Naval Postgraduate School, Monterey, CA USA

**Propagating A\*: Searching State Graphs in Order to Find a Valid Instrument Approach Configuration**

Bottin, Trent L; Sep 2007; 85 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473803; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The helicopter community has consistently been overlooked in the development of the National Airspace System. The unique flight characteristics of these aircraft make them ideally suited for a wide range of missions that are critical to national defense, medical first response and disaster relief. Full exploitation of these capabilities is limited during inclement weather because the existing airspace plan was developed around fixed wing aircraft. More specifically, the Federal Aviation Administration lacks the resource to generate terminal area procedures for aircraft not restricted to prepared landing surfaces. This thesis focuses on the development of a suitable terminal instrument approach procedure generation capability. Artificially intelligent path planning and computer graphics-based collision detection techniques are used to find valid approach procedures that are compliant with the requirements set forth by the Federal Aviation Administration. A variant of the classic A\* graph search algorithm is introduced that propagates state change information to successor nodes. The propagation technique allows the algorithm to search the graph in a single pass even though children nodes often impose a state change on their parent nodes.

DTIC

*Algorithms; Helicopters; Instrument Approach; Instrument Landing Systems*

**20080002647** Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium

**Advances on Propulsion Technology for High-Speed Aircraft. Volume 1**

Mar 2007; 204 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8655-07-1-5052

Report No.(s): AD-A473843; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Final Proceedings for Advances in Propulsion Technology for High-Speed Aircraft, 12 March 2007-15 March 2007. The demand for supersonic vehicles is believed to boost in the incoming years. This VKI/RTO lecture series will review the current state of the art of high speed propulsion for both airplanes and space launchers. Hypersonic air-breathing vehicles technology benefits and challenges will be discussed, with particular attention to the recent hypersonic activities in the USA. Then recommendations for future technology development will be presented. A series of specific talks will address advanced engine technology cycles, pulsed detonation engines and turbine based cycles. A couple of lectures dedicated to rocket engines will discuss turbomachinery issues and recent developments on materials and the combustion chamber. Afterwards, ramjets, scram jets and dual mode operation will be examined. Dedicated sessions will present the experience acquired in recent years in developing advanced demonstrators in the USA, Russia, Australia and the European Union. In the light of existing environmental concerns, the program will be completed with specific sessions on noise generation from high-speed jets and chemical pollution. The requirements to implement a complete hydrogen technology will be analyzed based on the experience gained in the Cryoplane project. The Directors of this VKI/RTO Lecture Series are Prof. G. Paniagua of the von Karman Institute and Prof. J. Steelant of the European Space Agency ESTEC.

DTIC

*Hypersonic Vehicles; Propulsion; Propulsion System Configurations; Propulsion System Performance*

**20080002648** Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium

**Advances on Propulsion Technology for High-Speed Aircraft. Volume 2**

Mar 2007; 278 pp.; In English

Contract(s)/Grant(s): FA8655-07-1-5052

Report No.(s): AD-A473844; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Final Proceedings for Advances in Propulsion Technology for High-Speed Aircraft, 12 March 2007-15 March 2007.

The demand for supersonic vehicles is believed to boost in the incoming years. This VKI/RTO lecture series will review the current state of the art of high speed propulsion for both airplanes and space launchers. Hypersonic air-breathing vehicles technology benefits and challenges will be discussed, with particular attention to the recent hypersonic activities in the USA. Then recommendations for future technology development will be presented. A series of specific talks will address advanced engine technology cycles, pulsed detonation engines and turbine based cycles. A couple of lectures dedicated to rocket engines will discuss turbomachinery issues and recent developments on materials and the combustion chamber. Afterwards, ramjets, scram jets and dual mode operation will be examined. Dedicated sessions will present the experience acquired in recent years in developing advanced demonstrators in the USA, Russia, Australia and the European Union. In the light of existing environmental concerns, the program will be completed with specific sessions on noise generation from high-speed jets and chemical pollution. The requirements to implement a complete hydrogen technology will be analyzed based on the experience gained in the Cryoplane project. The Directors of this VKI/RTO Lecture Series are Prof. G. Paniagua of the von Karman Institute and Prof. J. Steelant of the European Space Agency ESTEC.

DTIC

*Hypersonic Vehicles; Propulsion; Propulsion System Configurations; Propulsion System Performance*

**2008002658** Naval Postgraduate School, Monterey, CA USA

**The Use of Commercial Remote Sensing Predicting Helicopter Brownout Conditions**

Davis, Anthony; Sep 2007; 93 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473870; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Observations of potential helicopter landing zones are analyzed to determine suitability with respect to helicopter brownout. Imagery from civil and commercial satellites is used. VNIR and LWIR imagery of Yuma Proving Grounds taken by the ASTER sensor are analyzed. NDVI calculations from the VNIR data are used to define bare earth and vegetated areas. Some correlation is found in LWIR signatures, but the 60-m GSD for those bands limits utility. QuickBird MSI taken over Iraq is also analyzed for vegetation; results could not be ground truthed.

DTIC

*Detection; Helicopters; Predictions; Remote Sensing; Space Commercialization*

**2008002805** Conceptual MindWorks, Inc., San Antonio, TX USA

**Effects of Positive Acceleration on Corneal Stability in Photorefractive Keratectomy (PRK) Subjects**

Thompson, William T; O'Connor, Robert B; Dooley, James W; Tutt, Ronald C; Ivan, Douglas J; Baldwin, J B; Hiers, Paul L; Jun 2005; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473850; SAM-FE-BR-TR-2005-0002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study was a unique aeromedical investigational into the impact of high +Gz exposure on the human cornea on both untreated and treated subjects after photorefractive keratectomy (PRK) It is the first published scientific report to examine corneal stability using advanced technology to evaluate non%al and post PkK corneas effects as a consequence of high +Gz levels associated with high performance military aircraft To examine corneal stability of untreated and treated eyes, repeated data collections were accomplished prior to and at defined time intervals following surgical treatment. Analyzed data found that all ocular surface and refractive measures captured did not significantly differ between untreated and PkK treated subjects under +Gz exposure up to +9 Gz sustained or associated with common air combat maneuvers. Visual acuity, while found to be significantly decreased overall with exposure to high +Gz, did not significantly differ between untreated and treated subjects. It is believed that vibration induced effects were the primary factor causing this. More specifically, PkK subjects performed no differently than non-PkK subjects on visual acuity challenges in this study.

DTIC

*Acceleration (Physics); Cornea; Exposure; Eye (Anatomy); Stability; Surgery*

**20080012276** Ohio State Univ., Columbus, OH USA

**Flight simulator with spaced visuals**

Gilson, Richard D., Inventor; Thurston, Marlin O., Inventor; Olson, Karl W., Inventor; Ventola, Ronald W., Inventor; December 30, 1980; 43 pp.; In English

Contract(s)/Grant(s): NAS2-8954

Patent Info.: Filed January 25, 1979; US-PATENT-4,241,519; US-PATENT-APPL-SN-006333; No Copyright; Avail.: CASI: A03, Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012276>

A flight simulator arrangement wherein a conventional, movable base flight trainer is combined with a visual cue display surface spaced a predetermined distance from an eye position within the trainer. Thus, three degrees of motive freedom (roll, pitch and crab) are provided for a visual proprioceptive, and vestibular cue system by the trainer while the remaining geometric visual cue image alterations are developed by a video system. A geometric approach to computing runway image eliminates a need to electronically compute trigonometric functions, while utilization of a line generator and designated vanishing point at the video system raster permits facile development of the images of the longitudinal edges of the runway. Official Gazette of the U.S. Patent and Trademark Office  
*Eye (Anatomy); Flight Simulators; Training Devices; Visual Stimuli*

## 07

### AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power; 28 Propellants and Fuels; and 44 Energy Production and Conversion.

**20080001455** NASA Glenn Research Center, Cleveland, OH, USA

#### **Notch Fatigue Strength of a PM Disk Superalloy**

Gayda, John; Gabb, Timothy P.; Telesman, Jack; October 2007; 14 pp.; In English; Materials Science and Technology 2007 Conference and Exhibit (MS&T'07), 16-20 Sep. 2007, Detroit, MI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 698259.02.07.03.04

Report No.(s): NASA/TM-2007-215046; E-16259; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001455>

New powder metallurgy (PM) disk superalloys, such as ME3, LSHR, and Alloy 10, have been developed in recent years which enable rim temperatures in turbine disk applications to approach 1300 F. Before these alloys can be utilized at 1300 F their long term durability must be ensured. One of the key requirements for disk rims is notch fatigue strength. This issue is extremely important and is a direct result of the blade attachment geometry employed at the disk rim. Further, the imposition of a dwell at maximum load, associated with take off and landing, can also affect notch fatigue strength. For these reasons a study has been undertaken to assess the notch dwell fatigue strength of a modern PM disk alloy through spin pit evaluation of a prototypical disk. The first element of this program involves screening potential heat treatments with respect to notch fatigue strength at 1300 F utilizing a conventional notch fatigue specimen with a stress concentration factor ( $K_{(sub\ t)}$ ) of 2 and a 90 sec dwell at peak load. The results of this effort are reported in this paper including the downselect of an optimal heat treatment, from a notch fatigue standpoint.

Author

*Heat Resistant Alloys; Metal Fatigue; Gas Turbines; Powder Metallurgy; Loads (Forces); Heat Treatment; Service Life; Stress Concentration*

**20080001682** Colorado Univ., Boulder, CO USA

#### **Fundamental Studies of Inkjet Based Fuel Injection Technology for Pulsed Detonation Engines**

Daily, John W; Sep 30, 2005; 14 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0133

Report No.(s): AD-A473163; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473163>

The University of Colorado, in collaboration with TDA Research Inc., worked on using inkjet type concepts to develop MEMS technology for fuel injection for pulsed detonation engines (PDE). We considered this approach because of the requirements of periodic injection, small droplet size and distributed injection. We demonstrated the potential for injectors based on inkjet technology to meet PDE needs. We evaluated commercially available inkjet technologies, developed a large array atomizer conceptual design, and reviewed and compared current atomization techniques to military specifications. The results of our study showed that new injection technology would be required and that inkjet-type MEMS technology does have the potential to meet PDE needs. During the first year of the AFOSR program we explored issues such as material

compatibility, flow throughput, and actuation design. We carried out finite element stress analysis simulations for various pump configurations and volume of fluid (VOF) analysis of jet breakup. During the second year our work focused on developing comprehensive simulations of real pump designs. We successfully modeled a passive valve pump and showed that the simulation correctly predicts behavior observed in the literature. During the final year of funding we focused on design optimization using multi-physics simulations and assisting in prototype testing.

DTIC

*Detonation; Engines; Fuel Injection; Microelectromechanical Systems; Pulse Detonation Engines*

**20080002274** NASA Glenn Research Center, Cleveland, OH, USA

**Low Emission Hydrogen Combustors for Gas Turbines Using Lean Direct Injection**

Marek, C. John; Smith, Timothy D.; Kundu, Krishna; July 10, 2005; 27 pp.; In English; 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-066-10-12

Report No.(s): AIAA Paper-2005-3776; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002274>

One of the key technology challenges for the use of hydrogen in gas turbine engines is the performance of the combustion system, in particular the fuel injectors. To investigate the combustion performance of gaseous hydrogen fuel injectors flame tube combustor experiments were performed. Tests were conducted to measure the nitrogen oxide (NO<sub>x</sub>) emissions and combustion performance at inlet conditions of 600 to 1000 deg F, 60 to 200 pounds per square inch absolute (psia), and equivalence ratios up to 0.48. All the injectors were based on Lean Direct Injection (LDI) technology with multiple injection points and quick mixing. One challenge to hydrogen based premixing combustion systems is flashback since hydrogen has a reaction rate over seven times that of Jet-A. To reduce the risk, design mixing times were kept short and velocities high to minimize flashback. Five fuel injector designs were tested in 2.5 and 3.5-in. diameter flame tubes with non-vitiated heated air and gaseous hydrogen. Data is presented on measurements of NO<sub>x</sub> emissions and combustion efficiency for the hydrogen injectors at 1.0, 3.125, and 5.375 in. from the injector face. Results show that for some configurations, NO<sub>x</sub> emissions are comparable to that of state of the art Jet-A LDI combustor concepts.

Author

*Combustion Efficiency; Flashback; Gas Turbine Engines; Hydrogen Fuels; Premixing; Fuel Injection*

**20080002371** Academy of Sciences (Russia), Moscow, Russian Federation

**MHD Flow Control**

Bityurin, Valentin A; Sep 2006; 236 pp.; In English

Report No.(s): AD-A473536; ISTC-2196P; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473536>

This report results from a contract tasking Institute of High Temperatures RAS as follows: Task I: Renewed scientific interest has arisen throughout the world as to the potential application of Magneto Hydrodynamics (MHD) processes for advancement of flight. Among the areas of interest is the utilization of MHD as a means for enhancing the speed and range of scramjets through a concept known as MHD energy bypass. Currently, scramjet operation is limited to free stream flight Mach numbers around 10. This limitation arises from the excessive temperature that develops at high Mach conditions as a result of the slowing down of the propulsion drafted hypersonic air stream within the propulsion system inlet. The extra benefit of this proposed Project is the experimental facility to be used for experimental studies of MHD effects in hypervelocity flows that is an MHD assisted wind tunnel. Therefore, operation of this facility will provide valuable information on MHD interaction taking place in MHD accelerator. All experimental results can be and will be used to validate existing computer codes for such processes. Task 2: One of the main problems of stable combustion in high-speed flow is an effective mixing of gaseous fuel and oxidant providing full combustion during the resident time in combustor chamber. Generally speaking in-flow mixing consists of two main mechanisms: kinematics mixing (convection) and molecular diffusion. The latter is a final stage of mixing needed to provide extended combustible mixture. Kinematics mixing is more effective in vortex flows; the higher vortices the better kinematics mixing which means the larger fuel/oxidant interface surface. The second mixing mechanisms, diffusion, forms a reacting volume estimated as the interface surface times diffusion length.

DTIC

*Magnetohydrodynamic Flow; Magnetohydrodynamics; Supersonic Combustion Ramjet Engines*

**AIRCRAFT STABILITY AND CONTROL**

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also 05 Aircraft Design, Testing and Performance; and 06 Avionics and Aircraft Instrumentation.

**2008000776** NASA Dryden Flight Research Center, Edwards, CA, USA

**Autonomous Soaring**

Lin, Victor; Allen, Michael; [October 2007]; In English; No Copyright; Avail.: CASI: [C01](#), CD-ROM

A guidance and control method was developed to detect and exploit thermals for energy gain. Latency in energy rate estimation degraded performance. The concept of a UAV harvesting energy from the atmosphere has been shown to be feasible with existing technology. Many UAVs have similar mission constraints to birds and sailplanes. a) Surveillance; b) Point to point flight with minimal energy; and c) Increased ground speed.

Derived from text

*Flight Tests; Surveillance; Autonomy; Soaring; Gliders; Pilotless Aircraft*

**2008001809** NASA Dryden Flight Research Center, Edwards, CA, USA

**Flight Test Results from the NF-15B Intelligent Flight Control System (IFCS) Project with Adaptation to a Simulated Stabilator Failure**

Bosworth, John T.; Williams-Hayes, Peggy S.; December 2007; 35 pp.; In English; AIAA 2007 Conference and Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2007-214629; H-2751; AIAA-2007-2818; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001809>

Adaptive flight control systems have the potential to be more resilient to extreme changes in airplane behavior. Extreme changes could be a result of a system failure or of damage to the airplane. A direct adaptive neural-network-based flight control system was developed for the National Aeronautics and Space Administration NF-15B Intelligent Flight Control System airplane and subjected to an inflight simulation of a failed (frozen) (unmovable) stabilator. Formation flight handling qualities evaluations were performed with and without neural network adaptation. The results of these flight tests are presented. Comparison with simulation predictions and analysis of the performance of the adaptation system are discussed. The performance of the adaptation system is assessed in terms of its ability to decouple the roll and pitch response and reestablish good onboard model tracking. Flight evaluation with the simulated stabilator failure and adaptation engaged showed that there was generally improvement in the pitch response; however, a tendency for roll pilot-induced oscillation was experienced. A detailed discussion of the cause of the mixed results is presented.

Author

*Adaptive Control; Flight Control; Neural Nets; Formation Flying; Aircraft Stability; Stability Tests; Adaptation*

**20080012254** Ohio State Univ., Columbus, OH USA

**Semi-automatic aircraft control system**

Gilson, Richard D., Inventor; June 6, 1978; 16 pp.; In English

Contract(s)/Grant(s): NAS2-8954

Patent Info.: Filed March 7, 1977; US-PATENT-4,093,159; US-PATENT-APPL-SN-775384; No Copyright; Avail.: CASI:

[A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012254>

A flight control type system which provides a tactile readout to the hand of a pilot for directing elevator control during both approach to flare-out and departure maneuvers. For altitudes above flare-out, the system sums the instantaneous coefficient of lift signals of a lift transducer with a generated signal representing ideal coefficient of lift for approach to flare-out, i.e., a value of about 30% below stall. Error signals resulting from the summation are read out by the noted tactile device. Below flare altitude, an altitude responsive variation is summed with the signal representing ideal coefficient of lift to provide error signal readout.

Official Gazette of the U.S. Patent and Trademark Office

*Aircraft Control; Automatic Control; Flight Control; Readout*

**RESEARCH AND SUPPORT FACILITIES (AIR)**

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronomical facilities see *14 Ground Support Systems and Facilities (Space)*.

**2008000423** California State Univ., Long Beach, CA USA

**Strategic Mobility 21: Integrated Tracking System Analysis and Concept Design**

Mallon, Lawrence G; Savacool, Edwin; Aug 31, 2007; 48 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-C-0060

Report No.(s): AD-A472263; LBF-CR-0009-0010-0012; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472263>

Strategic Mobility 21 (SM21) is a Congressionally mandated and independently funded applied research program through the Dept. of Defense (Office of Naval Research), under the auspices of the California State University Long Beach Foundation, a government industry academic collaborative enterprise. This design document supports the SM21 efforts in developing a dual-use multi-modal node at the Southern California Logistics Airport in Victorville, CA that will be supported by an Integrated Tracking System (ITS). This ITS design document identifies the technical and functional requirements for developing, procuring, and integrating components of an ITS capable of supporting an inland regional port, multi i-modal operating software system. The design document supports the individual terminal operations by: optimizing logistics flows; helping to maintain desired productivity; and providing high service quality to strengthen customer relationships through up to the minute visibility of shipments and quick turn times.

DTIC

*Mobility; Multisensor Fusion; Systems Analysis; Systems Integration*

**2008000552** California State Univ., Long Beach, CA USA

**Economic Feasibility Analysis Report. Strategic Mobility 21**

Mallon, Lawrence G; Monaco, Kristen; Fetty, George R; Aug 31, 2007; 28 pp.; In English

Contract(s)/Grant(s): N00014-06-C-0060-0007

Report No.(s): AD-A472306; CR-0007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Strategic Mobility 21 (SM 21) is a multi-year functional equivalent of a DoD JCTD of advanced logistics concepts, using Southern California Logistics Airport (SCLA), a 5,000+ acre multi-modal inland transfer facility and warehouse and distribution center complex in Victorville, CA as an integrated demonstration platform prototype for dual military and commercial use. This multi-disciplinary analysis provides an objective examination of the economic and operational feasibility of a shuttle train intermodal rail operation under various scenarios connecting the San Pedro Bay port complex and SCLA. The shuttle train is one element of an Agile Port System (APS) combining an efficient marine terminal, dedicated freight corridor and integrated inland facility. The business and cost model described in the analysis is presented within the operational context of a long haul main line transcontinental rail network linking regional and national goods movement patterns. The potential role of SCLA in alleviating projected future short falls in regional main line and intermodal rail capacity is also addressed.

DTIC

*Airports; Cost Effectiveness; Economic Analysis; Feasibility; Feasibility Analysis; Mobility; Rail Transportation*

**2008000597** Department of Defense, Arlington, VA USA

**Force Structure Changes in the U.S. Pacific Command - Andersen Air Force Base War Reserve Materiel**

Scott, Wanda A; Crosier, Deborah D; Mar 12, 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000LA-0124.001

Report No.(s): AD-A472377; IG/DOD-D-2007-068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall objective of this audit was to evaluate the force structure changes in the U.S. Pacific Command (USPACOM). Specifically, the Inspector General (IG), Department of Defense (DoD) evaluated the force structure requirements, criteria, and costs, as well as host-nation support roles and their impact on the readiness of U.S. forces in the USPACOM. This is one in a series of reports on the changes to the force structure in USPACOM. The report addresses the readiness of war reserve materiel (WRM) stored at Andersen Air Force Base, Guam. Results show that the 36th Wing did not provide oversight for WRM located at Andersen Air Force Base. Quality assurance evaluators were not assigned to provide oversight of



contractor-maintained WRM basic expeditionary airfield resources (BEAR) kits, as required by Air Force Instruction 25-101. 'War Reserve Materiel Program Guidance and Procedures,' May 2, 1995. As part of the Air Force war reserve materiel, BEAR kits are deployable to any theater of operation to establish airfield facilities and operational support at unimproved air bases for up to 1,100 personnel. BEAR kits include, but are not limited to, lodging, a field kitchen, showers, latrines, offices, shops, and runway matting. Because quality assurance evaluators were not assigned to provide oversight of the BEAR kits, Pacific Air Forces cannot be sure that the contractor-maintained assets are operationally ready to support worldwide military operations. On October 2, 2006, the 36th Wing officials stated that they had appointed quality assurance evaluators to oversee the BEAR kits. Until quality assurance evaluations are performed, the 36th Wing cannot confirm that the contractor-maintained BEAR kits are ready to fulfill operations plan requirements.

DTIC

*Airports; Guam; Kits; Landing Sites; Maintainability; Military Air Facilities; Warfare*

**20080001158** Portuguese Air Force Psychology Centre, Lisbon, Portugal  
**Portuguese Armed Forces in the International Security and Assistance Force in Afghanistan: Psychological Support for the Command of Kabul International Airport**

Surrador, Antonio A; Apr 2006; 15 pp.; In English

Report No.(s): AD-A472818; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Afghanistan; Airports; Armed Forces; Military Personnel; Personnel; Security*

**20080001222** RAND Corp., Santa Monica, CA USA  
**Budget Estimating Relationships for Depot-Level Reparables in the Air Force Flying Hour Program**

Hildebrandt, Gregory G; Jan 2007; 88 pp.; In English

Contract(s)/Grant(s): F49642-01-C-0003; FA7014-06-C-0001XC

Report No.(s): AD-A472980; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Budget estimating relationships 'BERs' for flying depot-level reparables 'DLRs' explain the direct effect of specified variables on obligated funds associated with spare parts that directly support the U.S. Air Force 'USAF' Flying Hour Program. In FY02, net sales of DLRs to Air Force commands hit historic highs. To provide the Air Force Cost Analysis Improvement Group with a tool to better understand the commands-- budgetary submissions, we develop several explanatory BERs to understand why flying DLRs are at their particular levels. Using longitudinal regression statistical methods, we explain the historical net sales of flying DLRs using estimating models that relate net sales to the contemporaneous values of aircraft characteristics, operational tempo, and time-related variables. This is but one part of a larger project to develop better estimating methods for use by the acquisition community and to examine the impact of Air Force and DoD policies on weapon system costs. The findings will also be of interest to those in the national security community who are involved in analyzing alternative military postures, and to members of the aircraft industry's analytical community.

DTIC

*Cost Analysis; Estimating; Maintenance; Spare Parts*

**20080001665** Civil Engineer Squadron (00319th), Grand Forks AFB, ND USA  
**Environmental Assessment: Construct Airfield Lighting Vault and Demolish Building 531 at Grand Forks Air Force Base**

Strom, Diane; Aug 2007; 102 pp.; In English

Report No.(s): AD-A473137; 319 CES/CEVA-2005-074; XC-319 CES/ND; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473137>

The purpose of the proposed action is to construct an airfield lighting vault facility. The existing airfield lighting vault was constructed in 1957 and cannot feasibly be repaired or altered to meet current UFC and safety criteria. GFAFB proposes to repair the airfield lighting system by replacing the existing airfield lighting vault with a new vault in an adjacent location. Total facility size should be approximately equal to or less than the total square footage of the existing facility (3,250 SF), while providing adequate space for all electrical components, circuitry, and safety clearances. The existing vault must remain in operation during the entire construction period of the new vault. There is a need to eliminate building 531 once the new facility is operational. Demolition of the old facility will be performed. Mission requirements, operational considerations, and location are incompatible with use by other components on base. Based on the Environmental Assessment performed for construction

of an airfield lighting vault and demolition of building 531, no significant environmental impact is anticipated from the proposed action.

DTIC

*Airports; Illuminating; Landing Sites*

**20080002269** NASA Langley Research Center, Hampton, VA, USA

**Preliminary Investigation of Curved Liner Sample in the NASA LaRC Curved Duct Test Rig**

Gerhold, Carl H.; Jones, Michael G.; Brown, Martha C.; December 04, 2007; 28 pp.; In English; Fall Acoustics Technical Working Group, 4-5 Dec. 2007, Cleveland, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.18.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002269>

This viewgraph presentation reviews the preliminary investigation of the curved liner sample in the NASA LaRC Curved Duct Test Rig (CDTR). It reviews the purpose of the Curved Duct Test Rig. Its purpose is to develop capability to investigate acoustic and aerodynamic properties in ducts. It has several features to accomplish that purpose: (1) Large scale (2) Flow rate to  $M = 0.275$  (3) Higher order mode control (4) Curved flow path (5) Adaptable test section (6) Flexible test configurations. The liner has minimal effect on turbulence or boundary layer growth in duct. The curved duct sample attenuation is affected by mode scattering. In conclusion, the CDTR is valid tool for aerodynamic and acoustic evaluation of duct treatment

CASI

*Acoustic Ducts; Aerodynamic Characteristics; Linings; Curvature; Ducts; Test Facilities*

## 12

### ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

**20080000545** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

**JPL Facilities and Software for Collaborative Design: 1994 - Present**

DeFlorio, Paul A.; October 1, 2004; 19 pp.; In English; European Space Agency Collaborative Engineering Workshop Proceedings, Concurrent Engineering for Space Applications Workshop, 30 Sep. - 2 Oct. 2004, Noordwijk, Netherlands; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40485>

The viewgraph presentation provides an overview of the history of the JPL Project Design Center (PDC) and, since 2000, the Center for Space Mission Architecture and Design (CSMAD). The discussion includes PDC objectives and scope; mission design metrics; distributed design; a software architecture timeline; facility design principles; optimized design for group work; CSMAD plan view, facility design, and infrastructure; and distributed collaboration tools.

CASI

*Design Analysis; Mission Planning; Plant Design*

**20080001007** University of Central Florida, Orlando, FL USA

**Knightsat Flight Design Review**

Kendall, Rebecca; Allen, Randal; Grant, Danielle; Stuhr, Daniel; Oliver, Lashanda; Young, Timothy; Dilworth, J G; Dunn, Jason; Hand, Daniel; Vega, Jessica; Aug 3, 2007; 89 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0302

Report No.(s): AD-A472645; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472645>

Flight competition report regarding the Knightsat, Nanosat-4 competition for the Air Force Research Laboratory. Knightsat, being a student ran organization, was spilt into three sub-systems, Attitude Determining Control Systems, Structures and Payload, and Power and Communications. Knightsat's primary goal is to obtain a stereo image of one point on the earth's surface. Knightsat's program manager and primary mentor was Dr Roger Johnson, who also coordinated

assistance for the project with NASA's prototype shop and the Florida Space Institute. Knightsat's design has been approved and the integration of all of the sub-systems is under way.

DTIC

*Design Analysis; Prototypes; Reconnaissance*

**20080001150** Science Applications International Corp., San Diego, CA USA

**Charge Control of Geosynchronous Spacecraft Using Field Effect Emitters**

Mandell, M J; Davis, V A; Gardner, B M; Wong, F K; Adamo, R C; Cooke, D L; Wheelock, A T; Jan 2007; 13 pp.; In English  
Contract(s)/Grant(s): FA8718-05-C-0001; Proj-1010

Report No.(s): AD-A472799; No Copyright; Avail.: Defense Technical Information Center (DTIC)

\*Space Systems Loral is conducting an IR&D program to determine the feasibility and effectiveness of field effect electron emitters for potential control of geosynchronous altitude spacecraft. This electron emitters will be based on Spindt Cathode Field Emission Array Technologies. The configuration studied here consists of two emitters, each with an area of about 1 cm<sup>2</sup> and emitting up to 1 mA of electrons at approximately 50eV energy. We show that it appears feasible to use electron emitters to control the surface charge of a satellite. Results concerning the placement and effectiveness of emitters and the spacecraft potential configuration under substorm conditions with and without emitter operations in sunlight, in eclipse, and during eclipse exit.

DTIC

*Electron Emission; Emitters; Geosynchronous Orbits; Spacecraft Charging; Spacecraft Control; Synchronous Satellites*

**20080001185** Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

**Computational Methods for Design, Control and Optimization**

Borggaard, J T; Burns, J A; Cliff, E M; Iliescu, T; Oct 1, 2007; 17 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0243

Report No.(s): AD-A472915; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work is a preliminary step in the development of general computational tools for large scale Riccati equations that arise in a variety of control and estimation problems. The results imply that, even when the Riccati equations are used for applications such as weather prediction, control theory concepts provide the basic information about the type of approximation schemes that produce mesh independence.

DTIC

*Aerospace Systems; Control Theory; Design Optimization*

**20080002218** Air Force Research Lab., Hanscom AFB, MA USA

**Nascap-2k Spacecraft Charging Code Overview**

Mandell, M J; Davis, V A; Cooke, D L; Wheelock, A T; Apr 2005; 22 pp.; In English

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A473373; AFRL-VS-HA-TR-2007-1094; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nascap-2k is a modern spacecraft charging code, replacing the older codes NASCAP/GEO, NASCAP/LEO, POLAR, and DynaPAC. The code builds on the physical principles, mathematical algorithms, and user experience developed over three decades of spacecraft charging research. Capabilities include surface charging in geosynchronous and interplanetary orbits, sheath and wake structure and current collection in low-Earth orbits, and auroral charging. External potential structure and particle trajectories are computed using a finite element method on a nested grid structure and may be visualized within the Nascap-2k interface. Space charge can be treated either analytically, self-consistently with particle trajectories, or by importing plume densities from an external code such as EPIC (Electric Propulsion Interactions Code). Particle-in-cell capabilities are available to study dynamic plasma effects. Auxiliary programs to Nascap-2k include Object Toolkit (for developing spacecraft surface models) and GridTool (for constructing nested grid structures around spacecraft models). The capabilities of the code are illustrated by way of three examples: charging of a geostationary satellite, self-consistent potentials for a negative probe in a LEO spacecraft wake, and potentials associated with thruster plumes.

DTIC

*Coding; Computerized Simulation; Spacecraft Charging*

**20080002349** RAND Corp., Santa Monica, CA USA

**Space Handbook: Astronautics and its Applications**

Buchheim, Robert W; Jan 2007; 353 pp.; In English

Report No.(s): AD-A473498; RAND-CB-136-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473498>

The 'Space Handbook,' first published in 1958, was designed to serve as a basic guide on the uses and characteristics of space systems, including astronautics and its applications, technology in the space environment, rocket vehicles, propulsion systems, propellants, internal power sources, structures and materials, flight path and orientation control, guidance, communication, observation and tracking, and atmospheric flight. Written at the request of the Hon. John W. McCormack, chairman of the House Select Committee on Astronautics and Space Exploration, it was produced in only three weeks using RAND's own funds in the public interest. Now, fifty years after its initial publication, and to celebrate RAND's 60th Anniversary, RAND is proud to bring this classic work back into print in paperback and digital formats.

DTIC

*Aerospace Engineering; Astronautics*

**20080002350** RAND Corp., Santa Monica, CA USA

**Planets for Man**

Dole, Stephen; Asimov, Isaac; Jan 2007; 254 pp.; In English

Report No.(s): AD-A473499; RAND-CB-183-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473499>

'Planets for Man' was written at the height of the space race, a few years before the first moon landing, when it was assumed that in the not-too-distant future human beings 'will be able to travel the vast distances to other stars.' The authors propose to determine-on the basis of then-current biological and cosmological knowledge - whether there are other worlds where humans can survive or where human life may even now be flourishing. This volume, co-authored by RAND researcher Stephen Dole and science fiction master Isaac Asimov, certainly one of the more unusual co-authorships in RAND's long history of research and publishing, was based on a more technical treatise authored by Dole, 'Habitable Planets for Man.' More than forty years after its initial publication, and to celebrate RAND's 60th Anniversary, RAND is proud to bring this classic work back into print in paperback and digital formats.

DTIC

*Habitability; Planets*

**20080002563** Naval Postgraduate School, Monterey, CA USA

**A Modest Proposal: For Preventing Space Operations from Being a Burden to the Navy, and for Making the Space Cadre Beneficial to the Community**

Bandini, Paul V; Dittmer, Andrew R; Sep 2007; 155 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473712; No Copyright; Avail.: Defense Technical Information Center (DTIC)

U.S. Navy efforts in implementing Department of Defense policy guidance for the effective integration of space capabilities and effects consist of a variety of multi-pronged and disjointed efforts. Lack of clear direction in analysis and identification of current and future requirements for space-related capabilities presents a hazard to implementation of the tenants of Sea Power 21 and Navy participation in future conflicts. This work proposes an alternative construct for the organization and utilization of Navy space resources against the backdrop of requirements levied by the 2001 U.S. Commission to Assess National Security Space Management and Organizations and resulting Department of Defense Directive 5101.2, DoD Executive Agent for Space. In order to accomplish its mission, the Navy must establish a clear focus of effort, consolidate and formalize space-related human capital and divest itself of space-specific undertakings not related to core functions. This thesis establishes arguments to propose that the USA Navy relinquish development, acquisition and satellite operations tasks to another service or agency, and invest in appropriately leveraging space assets through the professionalization and promotion of a robust, educated, experienced and capable Navy Space Cadre.

DTIC

*Navy; Space Missions*

**20080002880** Air Force Research Lab., Edwards AFB, CA USA

**Future of Space Propulsion (Preprint)**

Remen, John F; Liston, Glenn; Sep 4, 2007; 29 pp.; In English

Report No.(s): AD-A473520; AFRL-PR-ED-TP-2007-401; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473520>

A lot has happened in the area of space propulsion over the last 10 years prompting one to wonder, 'Where are we going next?' This paper will first take a quick look back at history and from this perspective postulate the future directions for space propulsion. Topics to be addressed include spacelift and spacecraft propulsion. The future holds many great opportunities but just as many technical challenges.

DTIC

*Spacecraft Propulsion; Rocket Thrust; Systems Integration*

**13**

**ASTRODYNAMICS**

Includes powered and free flight trajectories; orbital and launching dynamics.

**20080001052** Army Research Lab., Aberdeen Proving Ground, MD USA

**Feasibility of Determining Aerodynamic Coefficients for a NASA Apollo Body With the Use of Telemetry Data From Free Flight Range Testing**

Topper, Benjamin; Brown, T G; Bukowski, Edward; Davis, Bradford S; Hall, Rex A; Muller, Peter C; Vong, Timothy T; Brandon, Fred J; Sep 2007; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-1L162618AH80

Report No.(s): AD-A472739; ARL-TR-4271; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472739>

The U.S. Army Research Laboratory (ARL) was requested by the National Aeronautics and Space Administration's (NASA's) Langley Research Center to perform a free-flight experiment with telemetry (TM) instrumented sub-scaled re-entry vehicle in order to determine the feasibility of using TM to obtain aerodynamic coefficients. NASA's current ability to collect aerodynamics data of subscale re-entry vehicles has been limited to forced oscillation wind tunnel testing with a sting-mounted model or by free-flight testing in an indoor aeroballistic range. Both testing techniques have shortcomings. The presence of a rear sting and its effect on the capsule's aft-body flow field introduce uncertainties in forced oscillation test results, and aeroballistic testing provides a very limited set of data and relies on the ability to accurately measure small changes in the capsule's angle of attack, based on shadowgraph images. The current methods also limit NASA's abilities to test crew exploration vehicle (CEV) geometry variations such as offsetting the center of gravity and non-symmetrical mass distributions. ARL developed and demonstrated a unique experimental technique to capture the flight dynamics of sub-scaled re-entry vehicles while testing on an exterior ballistics range. This technique combines the gun launch of a projectile that uses a double-length 120-mm gun with an instrumentation package contained inside the re-entry vehicle. For the current phase 1 effort being described, a reduced size Apollo (see figure 1) shaped re-entry vehicle was used because of its similarity to the current CEV being proposed and the existence of vast empirical data available to validate this technique. Following muzzle exit, the sabot is discarded and an ARL-developed constellation of inertial and magnetic sensors generate raw data that is telemetered and captured via a ground station.

DTIC

*Aerodynamic Characteristics; Aerodynamic Coefficients; Flight Tests; Free Flight; Reentry Vehicles; Telemetry*

**20080002343** Air Force Research Lab., Edwards AFB, CA USA

**A Novel Distributed Ignition Method Using Single-Wall Carbon Nanotubes (SWCNTs) and a Low-Power Flash Light (Preprint)**

Chehroudi, B; Danczyk, S A; Sep 2006; 9 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473487; AFRL-PR-ED-TP-2006-245; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473487>

This paper describes a low-power novel ignition method that uses the energy of a single exposure of an ordinary camera

flash and SWCNTs to ignite various fuels. It is shown that this method is able to ignite solid, liquid, and gaseous fuels. The effects of the iron (Fe) nanoparticles (embedded in the SWCNTs) concentration on the ignition process have been studied. One application of this nano-technology based ignition method has been successfully demonstrated through an ignition of a single liquid fuel droplet, suggesting that this method may be extended to ignite liquid fuel sprays. This is important as fuel sprays are used in most engines to atomize the liquid to an ensemble of droplets. This new ignition method may also be extended to achieve 'distributed ignition' that would allow ignition to occur in numerous locations simultaneously. Such plurality of ignition sites is important in control of ignition event in homogeneously-charged compression ignition (HCCI) engine applications. HCCI operating mode is considered by many to be an important component of the future automotive engine for high efficiency and low emission of harmful pollutants.

DTIC

*Carbon Nanotubes; Ignition; Luminaires; Walls*

**20080002580** Knowledge Based Systems, Inc., College Station, TX USA

**Neural Dynamic Trajectory Design for Reentry Vehicles (Preprint)**

Verma, Ajay; Xu, Peng; Vadakkevedu, Kalyan; Mayer, Rick; Jul 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-06-C-3505; FA8650-04-M-3428; Proj-A05G

Report No.(s): AD-A473739; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The next generation of reentry vehicles is envisioned to have onboard autonomous capability of real-time trajectory planning to provide capability of responsive launch and delivering payload anywhere with precise flight termination. This capability is also desired to overcome, if possible, in-flight vehicle damage or control effector failure resulting in degraded vehicle performance. An aerial vehicle is modeled as a nonlinear multi-input-multi-output (MIMO) system. An ideal optimal trajectory control design system generates a series of control commands to achieve a desired trajectory under various disturbances and vehicle model uncertainties including aerodynamic perturbations caused by geometric damage to the vehicle. Conventional approaches suffer from the nonlinearity of the MIMO system, and the high-dimensionality of the system state space. In this paper, we apply a Neural Dynamic Optimization (NDO) based approach to overcome these difficulties. The core of an NDO model is a multilayer perceptron (MLP) neural network, which generates the control parameters online. The advantage of the NDO system is that it is very fast and gives the trajectory almost instantaneously. The bulk of the time consuming computation is required only during off-line training. The inputs of the MLP are the time-variant states of the MIMO systems. The outputs of the MLP are the near optimal control parameters.

DTIC

*Reentry Vehicles; Spacecraft Trajectories; Trajectories*

14

**GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)**

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

**20080000853** NASA Marshall Space Flight Center, Huntsville, AL, USA

**A One-Piece Lunar Regolith Bag Garage Prototype**

Smithers, G. A.; Nehls, M. K.; Hovater, M. A.; Evans, S. W.; Miller, J. S.; Broughton, R. M., Jr.; Beale, D.; Kilinc-Balci, F.; September 2007; 96 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TM-2007-215073; M-1199; Copyright; Avail.: CASI: [A05](#), Hardcopy

Shelter structures on the moon, even in early phases of exploration, should incorporate lunar materials as much as possible. This Technical Memorandum details the design and construction of a prototype for a one-piece regolith bag unpressurized garage concept and a materials testing program to investigate six candidate fabrics to learn how they might perform in the lunar environment. The conceptualization was that a lightweight fabric form be launched from Earth and landed on the lunar surface to be robotically filled with raw lunar regolith. Regolith bag fabric candidates included: Vectran(TM), Nextel(TM), Gore PTFE Fabric(TM), Zylon(TM), Twaron(TM), and Nomex(TM). Tensile (including post radiation exposure), fold, abrasion, and hypervelocity impact testing were performed under ambient conditions, and also performed under cold and elevated temperatures. In some cases, Johnson Space Center lunar simulant (JSC-1) was used in conjunction with testing. A series of preliminary structures was constructed during final prototype design based on the principles of the

classic masonry arch. The prototype was constructed of Kevlar(TM) and filled with vermiculite. The structure is free-standing, but has not yet been load tested. Future plans would be to construct higher fidelity prototypes and to conduct appropriate tests of the structure.

Author

*Regolith; Lunar Shelters; Lunar Rocks; Bags; Fabrics; Design Analysis; Lunar Bases; Prototypes*

## 15

### LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

**2008000351** Oregon State Univ., Corvallis, OR USA

#### **Design Techniques for Radiation Hardened Phase-Locked Loops**

Nemmani, Anantha N; Aug 23, 2005; 58 pp.; In English

Report No.(s): AD-A471478; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471478>

Spacecraft experience radiation in the course of their operation and all the electronic equipment on-board these vehicles has to be designed to withstand the effects of this radiation. This thesis describes the effects of total ionization dose (TID) and single-event transients (SET) in phase-locked loops -- an important circuit block for communication circuits and clock generation. The design of a digital phase-locked loop made tolerant to SET through redundancy and error correction techniques is described. Digital phase-locked loops also can incorporate self-calibration techniques to compensate for the effects of TID. A linear analysis is presented for the design of digital phase-locked loops. This digital phase-locked loop was fabricated in the Honeywell 0.35 micrometer SOI CMOS process.

DTIC

*Design Analysis; Ionizing Radiation; Loops; Metal Oxide Semiconductors; Phase Locked Systems; Radiation Hardening*

**2008000386** Department of Defense, Arlington, VA USA

#### **World-Wide Satellite Systems Program**

Jolliffe, Richard B; Wicecarver, Jacqueline L; Davis, Sean A; Dobish, Joseph S; Bisignano, Eric M; Fahey, David A; Dekle, Charles S; Fine, Ernest G; Milner, Jillisa H; Jul 23, 2007; 25 pp.; In English

Contract(s)/Grant(s): Proj-D2007-D000AS-0062.000

Report No.(s): AD-A472194; ID/DOD-D-2007-112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472194>

Civilian and military personnel involved in developing indefinite-delivery, indefinite-quantity (IDIQ) contracts and personnel who order off of IDIQ contracts should read this report. The report discusses compliance with Federal and DoD acquisition and contracting policy related to IDIQ contracts, participation of small businesses, information assurance requirements, effectiveness of internal controls, and the use of brand names. The World-Wide Satellite Systems (WWSS) program is procured through six IDIQ contracts that have a ceiling value of \$5 billion and are available for up to 5 years. The WWSS contracts were awarded to six prime contractors, including four small businesses. The WWSS program encompasses six satellite terminals and associated support services for those terminals. The Inspector General (IG), DoD performed this audit to determine whether the award and administration of the WWSS contracts were consistent with Federal and DoD acquisition and contracting policy, including information assurance requirements and small business participation. The IG determined that the WWSS contracts were consistent with Federal and DoD acquisition and contracting policies for acquisition planning, commercial acquisition, contract clauses, ordering, performance-based contracting, solicitation, and source selection. However, the IG also determined that program officials did not adequately justify the specification of brand names for delivery orders awarded off of the WWSS contracts, as required by the Federal Acquisition Regulation. Using brand name requirements without justification potentially precludes consideration of similar or better products manufactured by another company at a lower cost. Therefore, the IG recommended that the contracting officer for the WWSS program comply with the Federal Acquisition Regulation policy regarding brand names and ensure future contract files contain written justification for every order using brand names.

DTIC

*Communication Satellites; Contract Management; Earth Terminals; Government Procurement; Procurement; Satellite Communication*

**2008000615** Santa Clara Univ., CA USA

**(NANOSAT) The ONYX Nanosatellite Mission**

Kitts, Christopher; May 14, 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-1-0249; Proj-2305

Report No.(s): AD-A472448; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We are pleased to report that the SCU team successfully developed a working prototype for the entire spacecraft as per our original proposal with the lone exception being the inclusion of an integrated lens assembly-diffraction grating that was to be used on our science camera for the purposes of taking multi-spectral images (this assembly was never delivered by our partners at the Jet Propulsion Laboratory). Apart from this exception, the ONYX vehicle conformed to all IJNP prototype specifications, and all required functionalities of the integrated prototype were wirelessly demonstrated. In addition to the science camera, payload demonstrations included a test bed to demonstrate advance anomaly management capabilities, a distributed command and data handling system, and an educational thermal control experiment. Furthermore, the SCU team participated in all UNP design reviews and auxiliary events in order to take full advantage of the educational experiences offered by the UNP. This report does not attempt to detail the design of%or the processes used to develop the ONYX space system. For a technical program summary, a copy of the Flight Competition Review presentation slides are presented here as an attachment. Additional programmatic and technical documentation has been previously provided via FTP to the program file server. In addition, the references section of this report summarizes additional papers and student thesis documents that detail the development and technical design of the ONYX space system.

DTIC

*Artificial Satellites; Nanosatellites; Prototypes*

**2008000774** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Growing the First Stage of the Ares Launch Vehicles**

Priskos, Alex; Williams, Tom; Call, Kent; Brasfield, Fred; September 18, 2007; 32 pp.; In English; AIAA Space 2007, 18-20 Sept. 2007, Long Beach, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#),

Hardcopy

In accordance with the U.S. Vision for Space Exploration, NASA has been tasked to send human beings to the moon, Mars, and beyond. The First Stage of NASA's new Ares I Crew Launch Vehicle, which will loft the Orion Crew Exploration Vehicle into low-Earth orbit early next decade, will consist of a Space Shuttle-derived five-segment Reusable Solid Rocket Booster (RSRB); a pair of similar RSRBs also will be used on the Ares V cargo launch vehicle. This paper will discuss the basis for choosing the First Stage propulsion system; describe the activities the Exploration Launch Projects (ELP) Office is conducting to develop the First Stage; and offer a preview of future development activities including the Ares I-X test flight planned for 2009.

Author

*Ares I Launch Vehicle; Booster Rocket Engines; Solid Propellant Rocket Engines; Constellation Program*

**2008000775** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Flight and Integrated Testing: Blazing the Trail for the Ares Launch Vehicles**

Taylor, James L.; Cockrell, Charlie; Robinson, Kimberly; Tuma, Margaret L.; Flynn, Kevin C.; Briscoe, Jeri M.; September 18, 2007; 28 pp.; In English; AIAA Space 2007, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/2008000775>

It has been 30 years since the USA last designed and built a human-rated launch vehicle. The National Aeronautics and Space Administration (NASA) has marshaled unique resources from the government and private sectors that will carry the next generation of astronauts into space safer and more efficiently than ever and send them to the Moon to develop a permanent outpost. NASA's Flight and Integrated Test Office (FITO) located at Marshall Space Flight Center and the Ares I-X Mission Management Office have primary responsibility for developing and conducting critical ground and flight tests for the Ares I and Ares V launch vehicles. These tests will draw upon Saturn and the Space Shuttle experiences, which taught the value of using sound systems engineering practices, while also applying aerospace best practices such as 'test as you fly' and other lessons learned. FITO will use a variety of methods to reduce the technical, schedule, and cost risks of flying humans safely aboard a launch vehicle.

Author

*Ares 5 Cargo Launch Vehicle; Flight Tests; Ares I Launch Vehicle; Constellation Program; Engine Tests; Rocket Engine Design; Test Firing*



**20080000856** NASA Langley Research Center, Hampton, VA, USA

**Simulation and Analyses of Stage Separation of Two-Stage Reusable Launch Vehicles**

Pamadi, Bandu N.; Neiryneck, Thomas A.; Hotchko, Nathaniel J.; Tartabini, Paul V.; Scallion, William I.; Murphy, K. J.; Covell, Peter F.; [2007]; 27 pp.; In English; AIAA/CIRA 13th International Space Planes and Hypersonics Systems and Technologies Conference, 16-20 May 2005, Capua, Italy; Original contains color and black and white illustrations

Report No.(s): AIAA Paper-2005-3247; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000856>

NASA has initiated the development of methodologies, techniques and tools needed for analysis and simulation of stage separation of next generation reusable launch vehicles. As a part of this activity, ConSep simulation tool is being developed which is a MATLAB-based front-and-back-end to the commercially available ADAMS(Registered TradeMark) solver, an industry standard package for solving multi-body dynamic problems. This paper discusses the application of ConSep to the simulation and analysis of staging maneuvers of two-stage-to-orbit (TSTO) Bimere reusable launch vehicles, one staging at Mach 3 and the other at Mach 6. The proximity and isolated aerodynamic database were assembled using the data from wind tunnel tests conducted at NASA Langley Research Center. The effects of parametric variations in mass, inertia, flight path angle, altitude from their nominal values at staging were evaluated. Monte Carlo runs were performed for Mach 3 staging to evaluate the sensitivity to uncertainties in aerodynamic coefficients.

Author

*Stage Separation; Reusable Launch Vehicles; Approximation; Coefficients*

**20080000957** Library of Congress, Washington, DC USA

**Military Space Programs: Issues Concerning DOD's SBIRS and STSS Programs**

Smith, Marcia S; Nov 25, 2005; 7 pp.; In English

Report No.(s): AD-A472537; CRS-RS21148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472537>

The Department of Defense's (DOD's) programs to develop new satellites to alert U.S. military commanders to foreign missile launches, and to support missile defense objectives, are controversial because of cost growth and schedule slippage. SBIRS-High, managed by the Air Force, would replace existing Defense Support Program 'early warning' satellites. The Space Tracking and Surveillance System (STSS, formerly SBIRS-Low), managed by the Missile Defense Agency, would perform missile tracking and target discrimination for missile defense objectives. The SBIRS-High program has breached Nunn-McCurdy cost growth limits several times. This report will be updated.

DTIC

*Artificial Satellites; Early Warning Systems; Infrared Instruments; Military Operations; Missile Tracking; Space Programs; Spacecraft Tracking; Surveillance*

**20080000968** Library of Congress, Washington, DC USA

**Military Space Programs: Issues Concerning DOD's SBIRS and STSS Programs**

Smith, Marcia S; Nov 3, 2003; 7 pp.; In English

Report No.(s): AD-A472575; CRS-RS21148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472575>

The Department of Defense's (DOD's) programs to develop new satellites to alert U.S. military commanders to foreign missile launches, and to support missile defense objectives, are controversial because of cost growth and schedule slippage. SBIRS-High, managed by the Air Force, would replace existing Defense Support Program 'early warning' satellites. The Space Tracking and Surveillance System (STSS, formerly SBIRS-Low), managed by the Missile Defense Agency, would perform missile tracking and target discrimination for missile defense objectives. For FY2004, DOD is requesting \$617 million for SBIRS-High RDT&E, \$95 million for SBIRS-High procurement (of a backup control station), and \$300 million for STSS RDT&E. The House approved the requested funding in the FY2004 DOD authorization bill, while the Senate cut STSS by \$15.5 million (H.R. 1588/S. 1050). In the FY2004 DOD appropriations act (P.L. 108-87), SBIRS-High is fully funded, and STSS is cut by \$15.5 million.

DTIC

*Artificial Satellites; Missile Defense*

**2008000969** Library of Congress, Washington, DC USA

**Military Space Programs: Issues Concerning DOD's SBIRS and STSS Programs**

Smith, Marcia S; Mar 17, 2005; 7 pp.; In English

Report No.(s): AD-A472576; CRS-RS21148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472576>

The Department of Defense's (DOD's) programs to develop new satellites to alert U.S. military commanders to foreign missile launches, and to support missile defense objectives, are controversial because of cost growth and schedule slippage. SBIRS-High, managed by the Air Force, would replace existing Defense Support Program 'early warning' satellites. The Space Tracking and Surveillance System (STSS, formerly SBIRS-Low), managed by the Missile Defense Agency, would perform missile tracking and target discrimination for missile defense objectives. Despite a restructuring in 2002, the SBIRS-High program is encountering additional delays and cost increases.

DTIC

*Artificial Satellites; Missile Defense*

**2008000970** Library of Congress, Washington, DC USA

**Military Space Programs: Issues Concerning DOD's SBIRS and STSS Programs**

Smith, Marcia S; May 20, 2005; 7 pp.; In English

Report No.(s): AD-A472577; CRS-RS21148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472577>

The Department of Defense's (DOD's) programs to develop new satellites to alert U.S. military commanders to foreign missile launches, and to support missile defense objectives, are controversial because of cost growth and schedule slippage. SBIRS-High, managed by the Air Force, would replace existing Defense Support Program 'early warning' satellites. The Space Tracking and Surveillance System (STSS, formerly SBIRS-Low), managed by the Missile Defense Agency, would perform missile tracking and target discrimination for missile defense objectives. Despite a restructuring in 2002, the SBIRS-High program is encountering additional delays and cost increases.

DTIC

*Artificial Satellites; Missile Defense*

**2008000971** Library of Congress, Washington, DC USA

**Military Space Programs: Issues Concerning DOD's SBIRS and STSS Programs**

Smith, Marcia S; Jun 22, 2005; 7 pp.; In English

Report No.(s): AD-A472578; CRS-RS21148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472578>

The Department of Defense's (DOD's) programs to develop new satellites to alert U.S. military commanders to foreign missile launches, and to support missile defense objectives, are controversial because of cost growth and schedule slippage. SBIRS-High, managed by the Air Force, would replace existing Defense Support Program 'early warning' satellites. The Space Tracking and Surveillance System (STSS, formerly SBIRS-Low), managed by the Missile Defense Agency, would perform missile tracking and target discrimination for missile defense objectives. The SBIRS-High program has breached Nunn-McCurdy cost growth thresholds three times since 2002, most recently in March 2005.

DTIC

*Artificial Satellites; Missile Defense*

**20080001174** Air Force Research Lab., Hanscom AFB, MA USA

**Nascap-2k Spacecraft-Plasma Environment Interactions Modeling: New Capabilities and Verification**

Davis, V A; Mandell, M J; Cooke, D L; Ferguson, D C; Jan 2007; 18 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A472880; AFRL-VS-HA-TR-2007-1089; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nascap-2k is a three-dimensional computer code that models interactions between spacecraft and plasma environments in low-Earth, auroral, geosynchronous, and interplanetary orbits. Previously, we reported on the accuracy of Nascap-2k's charging and current collections calculations by comparing computed currents and potentials with analytic results, and by comparing Nascap-2k results with published calculations using the earlier lower resolution codes, NASCAP/GEO, NASCAP/LEO, and POLAR. Here we examine the accuracy and limitations of two new capabilities of Nascap-2k: modeling

of plasma plumes such as generated by electric thrusters and enhanced PIC computational capabilities. Nascap-2k models one or more ion engine plumes in full three-dimensional geometry, including plume-plume plume-spacecraft interactions. The primary thruster beam, parameters describing the neutral efflux, and the initial charge-exchange plume are imported from a Plume Tool generated file. Nascap-2k generates and tracks charge-exchange ions to obtain plasma densities and calculates potentials consistent with plasma densities and object surfaces. Nascap-2k's PIC capability has been expanded to include boundary injection, particle splitting, and substep charge deposition. We use calculations for simple geometries to explore the accuracy and limitations of these capabilities.

DTIC

*Computer Programs; Computerized Simulation; Plasma Interactions; Spacecraft Charging; Spacecraft Environments*

**20080001183** Maryland Univ., College Park, MD USA

**Improving the Coverage of Earth Targets by Maneuvering Satellite Constellations**

Santos, Michel; Shapiro, Benjamin; Aug 23, 2007; 9 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0129; Proj-2304

Report No.(s): AD-A472910; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Satellite constellations around Earth can be used for observing and/or communicating with targets on the surface. This research mainly addressed maneuvering existing satellite constellations in order to improve coverage of multiple targets over a timespan of 30 to 120 days. However, designing new satellite constellations can also be addressed by using a portion of this research regarding coverage estimation. This research identified a direct relationship between a satellite's orbital geometry and the coverage provided by that satellite. This is accomplished by (1) identifying the view of the satellite orbit from an inertial sphere centered on the Earth, and (2) utilizing information from all the orbital views across the target's inertial latitude on order to arrive at lower and upper bounds on coverage. Altering a satellite orbit also alters the coverage that it provides. Gauss' variational equations were used to find maneuvering strategies that effect maximal changes in orbital geometry. These distinct maneuvering strategies were then compiled into a list that will be used in the subsequent optimization.

DTIC

*Algorithms; Earth Orbits; Maneuvers; Satellite Constellations; Targets*

**20080001641** National Taiwan Univ., Taipei, Taiwan, Province of China

**High Efficiency and Long Life Photovoltaic Research for Space Applications**

Su, Wei-Fang; Jul 5, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0075

Report No.(s): AD-A473101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473101>

We have developed a tree-like nanostructured photovoltaic device based on the polymer poly'3-hexylthiophene'P3HT/metal oxide hybrid materials by solution processes at low temperature. An array of large ZnO nanorods with a larger size of 50 nm in diameter and 150 nm in length are grown to act as tree trunks for efficient charge collection. Small TiO<sub>2</sub> nanorods with a size of 5 nm in diameter and 20 nm in length are incorporated to act as tree branches for facilitating charge separation and transport. The device based on the tree-like nanostructure exhibits a short circuit current density >2 mA/cm<sup>2</sup> under A.M. 1.5 illumination, showing over seven times increase compared to that without the incorporation of TiO<sub>2</sub> nanorods. Efficient charge separation and transport in the tree-like nanostructured photovoltaic device has further been demonstrated by time-resolved photoluminescence spectroscopy and transient photocurrent measurements

DTIC

*Aerospace Engineering; Photovoltaic Effect; Polymers; Technology Utilization*

**20080001948** Adelaide Univ., Australia

**Investigation of Passive Control Devices for Potential Application to a Launch Vehicle Structure to Reduce the Interior Noise Levels During Launch**

Howard, Carl Q; Hansen, Colin; May 25, 2006; 87 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA5209-05-P-0109

Report No.(s): AD-A473434; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This series of reports document a multi-year research project into the reduction of acoustic vibrations in space launch

vehicles using passive mass damping devices. The purpose of this report is to collate all the knowledge that has been gained during all four stages, into a single concise document.

DTIC

*Control Equipment; Damping; Launch Vehicles; Launching; Noise Intensity; Noise Reduction; Sound Pressure*

**20080002346** Naval Postgraduate School, Monterey, CA USA

**Filter Bank Approach to the Estimation of Flexible Modes in Dynamic Systems**

Tzellos, Konstantinos; Jun 2007; 75 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473493; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473493>

The problem of estimating frequencies of sinusoids buried in noise has been of great interest in both military and civilian applications. In particular, in Control Systems with flexible appendages the sinusoidal vibrations can cause instabilities and degrade the performance of the overall system. In this thesis the problem of identifying frequencies of disturbances in flexible systems using advanced Digital Signal Processing techniques such as filter banks and Quadrature Mirror Filters is addressed. In a number of situations there is a need to design a controller for a system with flexible modes. In particular, in space applications solar panels and robotic arms introduce flexible modes in the system which degrades the performance. In these kinds of applications, the frequencies of the flexible modes can not be modeled accurately a priori and they can change according to the operating conditions. The proposed approach is tested by computer simulations.....,Satellite systems are being deployed on a regular basis these days with various missions, namely civilian or military. Among them, at a great percentage, are communications and observation. However, it has been observed that for these cases the existing vibrations from the flexible surfaces of the satellite and the atmospheric interferences add colored noise and consequently undermine the system's performance. In this thesis an approach to estimate frequencies in noise based on Filter Banks and Quadrature Mirror Filters is developed. The general idea is to decompose the signal into components at various frequency bands and compute the relative energy in the single bands.

DTIC

*Aerospace Engineering; Computerized Simulation; Estimates*

**20080002361** Air Force Research Lab., Edwards AFB, CA USA

**Capillary Discharge Based Pulsed Plasma Thrusters (Preprint)**

Cambier, Jean-Luc; Young, Marcus; Pekker, Leonid; Pancotti, Anthony; Sep 20, 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A473518; AFRL-PR-ED-TP-2007-400; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473518>

Although pulsed plasma thrusters have significant experimental heritage over a range of power levels, more recently they are often described as attractive low-power thrusters due to their small dimensions, simplicity, and ability to provide high specific impulses at low power levels. This paper, however, discusses research into the potential application of an electrothermal capillary discharge as a pulsed plasma generator useful in high-power spacecraft propulsion. A 0D transient physical model of the capillary discharge was constructed and used to characterize the operational envelope of the capillary discharge. Fundamental experimental investigations were also conducted to demonstrate the performance of the polyethylene capillary discharge over a range of energy/shot levels (500-1500J), capillary lengths (4cm-10cm), and LRC circuit inductances. The experimentally measured parameters (voltage difference, current, ablated mass, plasma temperature, and electron number density) typically agreed with the model predicted values to within 20%. Thruster relevant performance calculations were made using the validated model and showed that even without nozzle expansion the capillary discharge can operate as an efficient (30-40%) source of high-pressure (>100 atm) plasma for use in spacecraft propulsion systems.

DTIC

*Plasma Generators; Propulsion System Configurations; Propulsion System Performance; Pulsed Plasma Thrusters*

**20080002444** University of Southern California, Los Angeles, CA USA

**Performance Characterization of the Free Molecule Micro-Resistojet Utilizing Water Propellant (Postprint)**

Lee, R H; Bauer, A M; Killingsworth, M D; Lilly, T C; Duncan, J A; Ketsdever, Andrew D; Jul 2007; 12 pp.; In English

Report No.(s): AD-A473667; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473667>

Advances in micro-technology manufacturing and capability have led to an increased interest in micro and nanosatellites.

A propulsion system has been designed to meet the on-orbit attitude control requirements for nanospacecraft. The Free Molecule Micro-Resistojet (FMMR), a low cost, low power, high propellant storage density, and green propulsion system, has been analyzed in this study to determine its ability to provide a slew maneuver for a typical 10 kg nanosatellite. Additionally, a FMMR technology demonstrator (TD) has been fabricated using traditional and Microelectromechanical Systems (MEMS) techniques. The TD has been analyzed and tested in this study to determine its performance characteristics while operating with water propellant. Experimental data shows that the FMMR, with a heated wall temperature of 580 K, can attain a specific impulse of 79.2 seconds with a thrust level of 129 micro-N. For a given mass flow, higher thrust levels can be achieved by increasing the temperature of the FMMR heater chip. The experimental results agree favorably with predicted values from kinetic theory. Applying the measured performance of the TD to an optimized setup, the FMMR system could provide a 45-degree slew of a typical nanosatellite in 60 seconds, which is acceptable for many nanosatellite applications.

DTIC

*Attitude Control; Plenum Chambers; Propellants; Resistojet Engines; Water*

**20080002590** Aerospace Corp., El Segundo, CA USA

**Preliminary Analysis of Particulate Infiltration into Space System Volumes**

Liu, De-Ling; Luey, Kenneth T; Sep 30, 2007; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8802-04-C-0001

Report No.(s): AD-A473752; TR-2007(8565)-7; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To understand the dynamics of airborne particulate intrusion into a simulated space telescope and other space system volumes, a simple model was developed to predict the extent to which ambient particles penetrate through vent holes and enter the volume interiors after the purge is off. This report describes the mathematical modeling analysis, experimental data from laboratory studies, and field measurements from launch processing. It was found that the characteristic time for infiltrating particulates to reach a saturation level inside the volume can be characterized by the air exchange rate and particle deposition rate. After the purge is turned off, the steady-state particulate concentrations inside the volume are governed by the ambient, air cleanliness level outside the telescope, air exchange rate, and particle deposition rate.

DTIC

*Aerospace Systems; Infiltration; Particulates*

**20080002802** National Security Space Office, Washington, DC USA

**Space-Based Solar Power As an Opportunity for Strategic Security: Phase 0 Architecture Feasibility Study**

Oct 10, 2007; 76 pp.; In English

Report No.(s): AD-A473860; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The magnitude of the looming energy and environmental problems is significant enough to warrant consideration of all options, to include revisiting a concept called Space Based Solar Power (SBSP) first invented in the USA almost 40 years ago. Advances technology and new challenges to security have warranted a current exploration of the strategic implications of SBSP. For these reasons, the National Security Space Office sponsored a no cost Phase 0 Architecture Feasibility Study of SBSP during the Spring and Summer of 2007. The report was compiled through an innovative and collaborative approach that relied heavily upon voluntary internet discussions by more than 170 academic, scientific, technical, legal, and business experts around the world. This interim assessment contains significant initial findings and recommendations that should provide pause and consideration for national and international policy makers, business leaders, and citizens alike. It appears that technological challenges are closing rapidly and the business case for creating SBSP is improving with each passing year. Still absent, however, is an appropriate catalyst to stimulate the various interested parties toward actually developing a SBSP capability.

DTIC

*Feasibility; Solar Energy*

## SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety*; *15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

**2008000854** Jacobs Engineering Group, Inc., Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

### Capillary Liquid Acquisition Device Heat Entrapment

Bolshinskiy, L. G.; Hastings, L. J.; Statham, G.; Turpin, J. B.; September 2007; 44 pp.; In English; Original contains color illustrations

Report No.(s): NASA/TM-2007-215074; M-1200; Copyright; Avail.: CASI: [A03](#), Hardcopy

Cryogenic liquid acquisition devices (LADs) for space-based propulsion interface directly with the feed system, which can be a significant heat leak source. Further, the accumulation of thermal energy within LAD channels can lead to the loss of subcooled propellant conditions and result in feed system cavitation during propellant outflow. Therefore, the fundamental question addressed by this program was: To what degree is natural convection in a cryogenic liquid constrained by the capillary screen meshes envisioned for LADs? Testing was first conducted with water as the test fluid, followed by LN<sub>2</sub> tests. In either case, the basic experimental approach was to heat the bottom of a cylindrical column of test fluid to establish stratification patterns measured by temperature sensors located above and below a horizontal screen barrier position. Experimentation was performed without barriers, with screens, and with a solid barrier. The two screen meshes tested were those typically used by LAD designers, 200x1400 and 325x2300, both with Twill Dutch Weave. Upon consideration of both the water and LN<sub>2</sub> data, it was concluded that heat transfer across the screen meshes was dependent upon barrier thermal conductivity and that the capillary screen meshes were impervious to natural convection currents.

Author

*Heat Transfer; Thermal Conductivity; Water; Convection Currents; Capillary Flow; Mesh; Screens; Cryogenic Fluids; Liquid Nitrogen*

## SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

**20080001875** Naval Academy, Annapolis, MD USA

### An Examination of Acceptable Navigation Accuracy for LISA Orbits

Smythe, Reid W; May 4, 2007; 60 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473319; USNA-TSPR-360; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project assessed the accuracy with which a formation of satellites, the Laser Interferometer Space Antenna (LISA), must be placed into orbit. The LISA formation will consist of three satellites orbiting the Sun, forming an equilateral triangle. The first phase dealt with the formation parameters (leg length, leg length time rate of change, interior leg angle, and formation-sun-earth angle) as a function of time. Duplication of plots contained in other papers on the topic validated the output of the analysis code. Preliminary analysis indicated the values of each parameter varied sinusoidally, and increasing the initial error conditions tended to reduce the time each parameter fell within the acceptable tolerance values. The second phase dealt with analyzing formation parameters as a function of the error size of specific initial conditions. Two of the eighteen state variables were varied simultaneously, resulting in a surface plot indicating how long a particular formation parameter was out of specification over the lifetime of the mission. The formation was most sensitive to velocity errors in the in-track direction. Furthermore, it appeared that one error can counter-act another error, agreeing with other papers on this topic. The third phase analyzed the effect of varying all eighteen variables simultaneously. A plot was created to show how the value of time out of specification for the leg length rate of change changes as the initial state variable tolerance changes. As the maximum variation in position and velocity errors increased, there was a corresponding increase in the amount of time the formation parameter was out of specification. A cross-section of the surface was created with position error range remaining constant while varying velocity error range. With an assumed maximum position error of zero, the formation tended

to start going out of specification at a velocity error magnitude of 2.6 cm/sec.

DTIC

*Accuracy; Navigation; Navigation Satellites; Orbits*

**20080002893** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Producing a Live HDTV Program from Space**

Grubbs, Rodney; Fontanot, Carlos; Hames, Kevin; October 24, 2007; 24 pp.; In English; Society of Motion Picture and Television Engineers Fall 2007 Technical Conference, 24-27 Oct. 2007, Brooklyn, NY, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002893>

By the year 2000, NASA had flown HDTV camcorders on three Space Shuttle missions: STS-95, STS-93 and STS-99. All three flights of these camcorders were accomplished with cooperation from the Japanese space agency (then known as NASDA and now known as JAXA). The cameras were large broadcast-standard cameras provided by NASDA and flight certified by both NASA and NASDA. The high-definition video shot during these missions was spectacular. Waiting for the return of the tapes to Earth emphasized the next logical step: finding a way to downlink the HDTV live from space. Both the Space Shuttle and the International Space Station (ISS) programs were interested in live HDTV from space, but neither had the resources to fully fund the technology. Technically, downlinking from the ISS was the most effective approach. Only when the Japanese broadcaster NHK and the Japanese space agency expressed interest in covering a Japanese astronaut's journey to the ISS did the project become possible. Together, JAXA and NHK offered equipment, technology, and funding toward the project. In return, NHK asked for a live HDTV downlink during one of its broadcast programs. NASA and the ISS Program sought a US partner to broadcast a live HDTV program and approached the Discovery Channel. The Discovery Channel had proposed a live HDTV project in response to NASA's previous call for offers. The Discovery Channel agreed to provide additional resources. With the final partner in place, the project was under way. Engineers in the Avionics Systems Division at NASA's Johnson Space Center (JSC) had already studied the various options for downlinking HDTV from the ISS. They concluded that the easiest way was to compress the HDTV so that the resulting data stream would 'look' like a payload data stream. The flight system would consist of a professional HDTV camcorder with live HD-SDI output, an HDTV MPEG-2 encoder, and a packetizer/protocol converter.

Derived from text

*Broadcasting; High Definition Television; International Space Station; Space Shuttles; Payloads; Cameras; Avionics; Downlinking*

## 18

### SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance*; *39 Structural Mechanics*; and *16 Space Transportation and Safety*.

**20080000345** NASA Johnson Space Center, Houston, TX, USA

**Orion Orbit Control Design and Analysis**

Jackson, Mark; Gonzalez, Rodolfo; Sims, Christopher; August 20, 2007; 15 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The analysis of candidate thruster configurations for the Crew Exploration Vehicle (CEV) is presented. Six candidate configurations were considered for the prime contractor baseline design. The analysis included analytical assessments of control authority, control precision, efficiency and robustness, as well as simulation assessments of control performance. The principles used in the analytic assessments of controllability, robustness and fuel performance are covered and results provided for the configurations assessed. Simulation analysis was conducted using a pulse width modulated, 6 DOF reaction system control law with a simplex-based thruster selection algorithm. Control laws were automatically derived from hardware configuration parameters including thruster locations, directions, magnitude and specific impulse, as well as vehicle mass properties. This parameterized controller allowed rapid assessment of multiple candidate layouts. Simulation results are presented for final phase rendezvous and docking, as well as low lunar orbit attitude hold. Finally, on-going analysis to

consider alternate Service Module designs and to assess the pilot-ability of the baseline design are discussed to provide a status of orbit control design work to date.

Author

*Design Analysis; Crew Exploration Vehicle; Rocket Engines; Spacecraft Components; Control Simulation*

## 19

### SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

**2008000561** NASA Dryden Flight Research Center, Edwards, CA, USA

#### **Overview of an Advanced Hypersonic Structural Concept Test Program**

Stephens, Craig A.; Hudson, Larry D.; Piazza, Anthony; November 2007; 18 pp.; In English; Fundamental Aeronautics Program Annual Meeting, 30 Oct. - 1 Nov. 2007, New Orleans, LA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/2008000561>

This viewgraph presentation provides an overview of hypersonics M&S advanced structural concepts development and experimental methods. The discussion on concepts development includes the background, task objectives, test plan, and current status of the C/SiC Ruddervator Subcomponent Test Article (RSTA). The discussion of experimental methods examines instrumentation needs, sensors of interest, and examples of ongoing efforts in the development of extreme environment sensors.

CASI

*Hypersonics; Structural Design; Sensors; Environmental Monitoring*

**2008000609** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

#### **Multidisciplinary Analysis and Optimal Design: As Easy as it Sounds?**

Moore, Greg; Chainyk, Mike; Schiermeier, John; October 8, 2004; 15 pp.; In English; CIMMS Fall Workshop Engineering in the Space Science: Dynamics, Computations, Communications, and Autonomy, 8 Oct. 2004, Pasadena, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40520>

The viewgraph presentation examines optimal design for precision, large aperture structures. Discussion focuses on aspects of design optimization, code architecture and current capabilities, and planned activities and collaborative area suggestions. The discussion of design optimization examines design sensitivity analysis; practical considerations; and new analytical environments including finite element-based capability for high-fidelity multidisciplinary analysis, design sensitivity, and optimization. The discussion of code architecture and current capabilities includes basic thermal and structural elements, nonlinear heat transfer solutions and process, and optical modes generation.

CASI

*Apertures; Design Analysis; Multidisciplinary Design Optimization; Design Optimization; Structural Analysis*

**2008002204** NASA Dryden Flight Research Center, Edwards, CA, USA

#### **TPS In-Flight Health Monitoring Project Progress Report**

Kostyk, Chris; Richards, Lance; Hudston, Larry; Prosser, William; February 28, 2007; 15 pp.; In English; NASA NDE Working Group Annual Meeting, 28 Feb. - 2 Mar. 2006, Boulder, CO, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/2008002204>

Progress in the development of new thermal protection systems (TPS) is reported. New approaches use embedded lightweight, sensitive, fiber optic strain and temperature sensors within the TPS. Goals of the program are to develop and demonstrate a prototype TPS health monitoring system, develop a thermal-based damage detection algorithm, characterize limits of sensor/system performance, and develop a methodology transferable to new designs of TPS health monitoring systems. Tasks completed during the project helped establish confidence in understanding of both test setup and the model and validated system/sensor performance in a simple TPS structure. Other progress included complete initial system testing,



commencement of the algorithm development effort, generation of a damaged thermal response characteristics database, initial development of a test plan for integration testing of proven FBG sensors in simple TPS structure, and development of partnerships to apply the technology.

Derived from text

*Thermal Protection; Temperature Sensors; Systems Engineering; Prototypes; In-Flight Monitoring; Spacecraft Reentry; Systems Health Monitoring*

## 20

### SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

**20080000778** NASA Marshall Space Flight Center, Huntsville, AL, USA

#### **The Effect of Acoustic Disturbances on the Operation of the Space Shuttle Main Engine Fuel Flowmeter**

Marcu, Bogdan; Szabo, Roland; Dorney, Dan; Zoladz, Tom; July 08, 2007; 22 pp.; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 8-11 Jul. 2007, Cincinnati, OH, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The Space Shuttle Main Engine (SSME) uses a turbine fuel flowmeter (FFM) in its Low Pressure Fuel Duct (LPFD) to measure liquid hydrogen flowrates during engine operation. The flowmeter is required to provide accurate and robust measurements of flow rates ranging from 10000 to 18000 GPM in an environment contaminated by duct vibration and duct internal acoustic disturbances. Errors exceeding 0.5% can have a significant impact on engine operation and mission completion. The accuracy of each sensor is monitored during hot-fire engine tests on the ground. Flow meters which do not meet requirements are not flown. Among other parameters, the device is screened for a specific behavior in which a small shift in the flow rate reading is registered during a period in which the actual fuel flow as measured by a facility meter does not change. Such behavior has been observed over the years for specific builds of the FFM and must be avoided or limited in magnitude in flight. Various analyses of the recorded data have been made prior to this report in an effort to understand the cause of the phenomenon; however, no conclusive cause for the shift in the instrument behavior has been found. The present report proposes an explanation of the phenomenon based on interactions between acoustic pressure disturbances in the duct and the wakes produced by the FFM flow straightener. Physical insight into the effects of acoustic plane wave disturbances was obtained using a simple analytical model. Based on that model, a series of three-dimensional unsteady viscous flow computational fluid dynamics (CFD) simulations were performed using the MSFC PHANTOM turbomachinery code. The code was customized to allow the FFM rotor speed to change at every time step according to the instantaneous fluid forces on the rotor, that, in turn, are affected by acoustic plane pressure waves propagating through the device. The results of the simulations show the variation in the rotation rate of the flowmeter due to the interaction of the flow straightener wakes and the upstream propagating acoustic waves. A detailed analysis of the acoustic disturbance effects is presented along with an assessment of the impact on measurement accuracy.

Author

*Space Shuttle Main Engine; Three Dimensional Flow; Fuel Flow; Flowmeters; Computational Fluid Dynamics; Engine Tests; Flow Velocity; Unsteady Flow*

**20080001958** Air Force Research Lab., Edwards AFB, CA USA

#### **High Density Magnetized Toroid Formation and Translation with XOCOT: An Annular Field Reversed Configuration Plasma Concept (Preprint)**

Kirtley, David; Gallimore, Alec D; Haas, James; Reilly, Michael; Sep 2007; 51 pp.; In English

Report No.(s): AD-A473469; AFRL-PR-ED-TP-2007-387; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An annular field reversed configuration (FRC) plasma concept is being developed by the University of Michigan and AFRL to investigate inductively-coupled high power electric propulsion. Presented is the continued exploration of an annular FRC with specific focus on main bank discharges, magnetized plasma toroid formation, and preliminary investigation into plasma translation. Additional detail is given towards discharge parameter space, optimization of energy input/translation, and predictive scaling laws of magnetic flux, plasma density, and plasma energy content. The discharge parameter space covers multiple charging energies, voltages, and timing as well as multiple propellants and pre-ionization techniques. Finally, a case

for FRC formation is made by investigating magnetic field (and flux) reversal in the coil as well as downstream magnetic field modification by a high density magnetized plasma.

DTIC

*Electric Propulsion; Plasmas (Physics); Toroids; Translating*

**2008002099** Tennessee Technological Univ., Cookeville, TN, USA

**Developing Capture Mechanisms and High-Fidelity Dynamic Models for the MXER Tether System**

Canfield, S. L.; September 2007; 157 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNM04AB13C

Report No.(s): NASA/CR-2007- 215076; M-1202; No Copyright; Avail.: CASI: [A08](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002099>

A team consisting of collaborators from Tennessee Technological University (TTU), Marshall Space Flight Center, BD Systems, and the University of Delaware (herein called the TTU team) conducted specific research and development activities in MXER tether systems during the base period of May 15, 2004 through September 30, 2006 under contract number NNM04AB13C. The team addressed two primary topics related to the MXER tether system: 1) Development of validated high-fidelity dynamic models of an elastic rotating tether and 2) development of feasible mechanisms to enable reliable rendezvous and capture. This contractor report will describe in detail the activities that were performed during the base period of this cycle-2 MXER tether activity and will summarize the results of this funded activity. The primary deliverables of this project were the quad trap, a robust capture mechanism proposed, developed, tested, and demonstrated with a high degree of feasibility and the detailed development of a validated high-fidelity elastic tether dynamic model provided through multiple formulations.

Author

*Dynamic Models; Tethering; Spacecraft Propulsion; Electromagnetic Propulsion; Space Transportation*

**2008002272** NASA Glenn Research Center, Cleveland, OH, USA

**Electric Propulsion System Modeling for the Proposed Prometheus 1 Mission**

Fiehler, Douglas; Dougherty, Ryan; Manzella, David; September 2005; 18 pp.; In English; 41st Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 982-10-41

Report No.(s): NASA/TM-2005-213892; AIAA Paper-2005-3891; E-15263; Copyright; Avail.: CASI: [A03](#), Hardcopy

The proposed Prometheus 1 spacecraft would utilize nuclear electric propulsion to propel the spacecraft to its ultimate destination where it would perform its primary mission. As part of the Prometheus 1 Phase A studies, system models were developed for each of the spacecraft subsystems that were integrated into one overarching system model. The Electric Propulsion System (EPS) model was developed using data from the Prometheus 1 electric propulsion technology development efforts. This EPS model was then used to provide both performance and mass information to the Prometheus 1 system model for total system trades. Development of the EPS model is described, detailing both the performance calculations as well as its evolution over the course of Phase A through three technical baselines. Model outputs are also presented, detailing the performance of the model and its direct relationship to the Prometheus 1 technology development efforts. These EP system model outputs are also analyzed chronologically showing the response of the model development to the four technical baselines during Prometheus 1 Phase A.

Author

*Nuclear Electric Propulsion; Spacecraft Propulsion; Dynamic Models; Hall Thrusters; Performance Prediction*

**2008002353** Air Force Research Lab., Edwards AFB, CA USA

**Analytical Extraction of Plasma Properties Using a Hall Thruster Efficiency Architecture (Preprint)**

Brown, Daniel L; Larson, C W; Hass, James M; Gallimore, Alec D; Aug 22, 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-5033

Report No.(s): AD-A473504; AFRL-PR-ED-TP-2007-394; IEPC-2007-188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473504>

An investigation of the conversion from anode electrical energy to jet kinetic energy in a laboratory model Hall thruster test-bed yielded an experimentally determined thrust efficiency based on the product of propellant, voltage, and current utilization. This method accounts for the effects of the ion velocity distribution function (VDF), electron recycle fraction,

plume divergence, and the fractional loss of acceleration voltage within the discharge chamber. The architecture of the efficiency analysis is such that energy efficiency becomes naturally expressed as a product of voltage and current utilization efficiencies, and is rigorously separated from propellant utilization efficiency. A systematic investigation of the performance and far-field plume measurements provided insight into the loss mechanisms and plasma properties from 100 to 400 V discharge. Experimental parameter groups are calculated based on the measured thrust and telemetry data. When interpreted with measured ion beam current and most probable ion voltage, the efficiency analysis enables several plasma parameters to be deciphered, including: average ion charge, ionization mass fraction, and momentum beam divergence half-angle. The following study creates an analytical map for extracting plasma parameters based on performance and plume measurements.

DTIC

*Extraction; Hall Thrusters; Plasmas (Physics)*

**20080002359** Air Force Research Lab., Edwards AFB, CA USA

**Calculating Sputter Rate Angular Dependence Using Optical Profilometry (Preprint)**

Barrie, Alexander C; Taylor, Bryan S; Ekholm, Jared M; Hargus, Jr, William A; Jul 26, 2007; 34 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473515; AFRL-PR-ED-TP-2007-381; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473515>

This work attempts to determine angular dependence curves for sputter rates of a material based on a single experimental measurement. An aluminum cylinder was exposed to a BHT-200 plume, and the resulting erosion profile was measured. This profile was fed into an optimizer, which calculated the angular dependence curve to match the given erosion profile. The calculated profile matched well with the experimental profile; however, neither matched well with previously published results. The likely cause of this discrepancy was the non-uniformity of the ion source used. As a further validation of the optimization routine, the angular dependence curve was input to the COLISEUM plasma modeling code, which generated the same erosion profile as the experimental data.

DTIC

*Profilometers; Sputtering*

**20080002360** Starfire Industries, LLC, Champaign, IL USA

**A Planar Hall Thruster for Investigating Electron Mobility in ExB Devices (Preprint)**

Rovey, Joshua L; Giacomi, Matthew P; Stubbers, Robert A; Jurczyk, Brian E; Aug 24, 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-33SP

Report No.(s): AD-A473516; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473516>

Stable operation of a Hall thruster that emits and collects the Hall current across a planar discharge channel is described. The planar Hall thruster (PHT) is being investigated for use as a test bed to study electron mobility in ExB devices. The planar geometry attempts to de-couple the complex electron motion found in annular thrusters by using simplified geometry. During this initial test, the PHT was operated at discharge voltages between 50-150 V to verify operability and stability of the device. Hall current was emitted by hollow cathode electron sources and collected by electrodes on the opposing wall of the thruster. Internal channel wall probes along with a downstream Faraday probe and retarding potential analyzer measured changes in thruster plasma as the Hall current, discharge voltage, magnetic field, and mass flow rates were changed. Results show that most of the plume ions are created in the acceleration zone. Further, increasing the magnetic field confines electrons to the Hall-drift region. This causes the Hall current to increase and the discharge current to decrease. Future experiments with this thruster are being planned to shed light on electron mobility in both planar and annular ExB geometry.

DTIC

*Electron Mobility; Hall Thrusters; Planar Structures*

**20080002362** Air Force Research Lab., Edwards AFB, CA USA

**Total and Differential Sputter Yields of Boron Nitride Measured by Quartz Crystal Microbalance and Weight Loss (Preprint)**

Rubin, Binyamin; Topper, James L; Yalin, Azer P; Sep 20, 2007; 14 pp.; In English

Contract(s)/Grant(s): Proj-4847

Report No.(s): AD-A473519; AFRL-PR-ED-TP-2007-406; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473519>

We present results of differential sputter yield measurements of HBC and HBR grades of boron nitride due to bombardment by xenon ions. Total sputter yield measurements are made using a weight loss approach. Differential sputter yield measurements (of condensable components) are made using a quartz crystal microbalance (QCM). The QCM measurement allows full angular resolution, i.e. differential sputtering yield measurements are measured as a function of both polar angle and azimuthal angle. Measured profiles are presented for 100, 250, 350 and 500 eV Xe<sup>+</sup> bombardment at 0-degree, 15-degree, 30-degree, and 45-degree angles of incidence. We fit the measured profiles with Modified Zhang expressions using two free parameters: the total sputter yield, Y, and characteristic energy E\*. Sputtering of HBC versus HBR grades of BN is compared, as is results of sputter measurements from the weight loss versus QCM approaches. Finally, effects of sample moisture absorption are considered.

DTIC

*Boron Nitrides; Electric Propulsion; Losses; Microbalances; Quartz Crystals; Sputtering*

**20080002634** Royal Aircraft Establishment, Farnborough, UK

**Further Considerations on Selection of an Oxidant for Rocket Motors**

Baxter, A D; Feb 1949; 9 pp.; In English

Report No.(s): AD-A473821; RAE-TN-RPD-11; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The note calls attention to the relative state of development and experience on hydrogen peroxide (HTP) and nitric acid as rocket motor oxidants. It is shown that some of the fears regarding storage and handling difficulties with HTP have not been justified and that development of nitric acid motors in this country requires at least 12 months to bring it up to the present stage of HTP motors. Some unfavourable consequences of the higher combustion temperature of nitric acid are also discussed.

DTIC

*Oxidizers; Rocket Engines*

**20080002637** Royal Aircraft Establishment, Farnborough, UK

**Mixing Nozzles for Liquid-Fuel Rocket Motors**

Diederichsen, J; Walder, H; Treutler, H H; Aug 1949; 26 pp.; In English

Report No.(s): AD-A473825; RAE-TN-RPD-19; No Copyright; Avail.: Defense Technical Information Center (DTIC)

When two immiscible liquids are to be used as rocket propellants it may be advantageous to spray them as a fine emulsion into the combustion chamber. Experimental work has been carried out on nozzles in which two liquids are caused to form an emulsion by means of rotational forces resulting from the pressure drop in various swirl nozzles. Modifications of well known types of swirl atomizers have been tried, but the best results have been obtained with a nozzle designed specially for mixing. Proposals are made for determining whether mixing nozzles give results which are better than those obtained by conventional methods of injection.

DTIC

*Liquid Fuels; Rocket Engines*

**20080002652** Royal Aircraft Establishment, Farnborough, UK

**Influence of Operating Pressure Upon the Weight of Liquid Propellant Rocket Motors for Medium Range Guided Missiles**

Baxter, A D; Frauenberger, J; Jul 1950; 23 pp.; In English

Report No.(s): AD-A473851; R.P.D.8; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The propellant consumption of a rocket motor decreases as the combustion chamber expansion ratio increases and with a given back pressure the expansion ratio is proportional to combustion chamber pressure. Any increase in the latter involves an increase in the weight of certain motor components. Hence the reduction in consumption by increasing the operating pressure of the motor is to some extent off set by an increase in motor weight, and it is likely that an optimum pressure will

be reached which gives a minimum all up weight of rocket motor and propellant for a given duty. In the past calculations have suggested that a chamber pressure of approximately 20 atm is the optimum. However, departures from this not infrequent as, for example, the V.2 which operated at 15 atm only and recent American designs which have chamber pressures of 50 atm. The actual optimum will be influenced by various factors such as the thrust level, time of operation, and the use of gas pressurized propellant tanks or turbo-pumps for delivering the propellant to the combustion chamber.

DTIC

*Liquid Propellant Rocket Engines; Missiles; Pressure Effects*

**20080002653** Royal Aircraft Establishment, Farnborough, UK

**Development of the Beta 1 Rocket Motor**

Broughton, L W; Kretschmer, W; Sep 1951; 50 pp.; In English

Report No.(s): AD-A473854; R.P.D.10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Beta I rocket motor was designed primarily as a power unit for a model aircraft built by the Fairey Aviation Co. for vertical take-off experiments. It is of the liquid bi-propellant type using the self-igniting combination hydrogen peroxide (80%) and C-fuel and gives a total thrust of 1800 lb for 45 seconds, (the duration being governed by the tank capacity of the aircraft). Whilst the general design of the motor follows well established principles it also incorporates a few interesting features as the regenerative cooling of the combustion chambers with hydrogen peroxide, a turbo pump propellant feed unit and a steam generator using silver plated gauze as the catalyst.

DTIC

*Aircraft Models; Rocket Engines*

**20080002655** Royal Aircraft Establishment, Bedford, UK

**The Limitations of Upper-Atmosphere Research Vehicles Powered by Current British Solid-Fuel Rockets**

King-Hele, D G; Dec 1953; 15 pp.; In English

Report No.(s): AD-A473859; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Two rocket motors were selected as typical of current British boost and sustainer motors respectively, and the minimum amounts of fin structure, etc., needed to convert them into aerodynamically stable vehicles were added. The performance of these single-stage vehicles in vertical climbs from sea level was evaluated by numerical integration. The maximum altitude attained was 120,000 ft. which is not much above the economical limit for balloons. If current rockets are to be of value in upper-atmosphere research, therefore, they must either be used in a single-stage arrangement, or be launched well above sea level, perhaps from a balloon or mountain top. Alternatively, a new solid fuel rocket motor with a long burning time and high length/diameter ratio could be designed specifically for the purpose of high-altitude research - this is probably the best approach.

DTIC

*Aerodynamics; Research Vehicles; Rocket Engines; United Kingdom; Upper Atmosphere*

**23**

**CHEMISTRY AND MATERIALS (GENERAL)**

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

**20080000805** Army Engineer Research and Development Center, Vicksburg, MS USA

**Photochemical Degradation of Composition B and Its Components**

Pennington, Judith C; Thorn, Kevin A; Cox, Larry G; MacMillan, Denise K; Yost, Sally; Laubscher, Randy D; Sep 2007; 64 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472238; ERDC/EL TR-07-16; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472238>

Products of photodecomposition of 2,4,6-trinitrotoluene (TNT) have been observed as a coating on TNT particles and as a fine powdered residue surrounding TNT particles on ranges receiving limited rainfall. The significance of photolysis of explosive formulations on training ranges is unknown. Therefore, photolysis of a common explosive formulation, Composition B, and its components in a soil matrix were evaluated. Objectives included determination of photolysis rates, effects of light intensity and duration, effects of moisture on photolysis, and identification of photolysis products. Irradiations

were performed in laboratory microcosms under controlled conditions. Solutions, solids, and both solutions and solid explosives spiked into soils were irradiated. Two approaches were used to characterize products: liquid chromatography/mass spectrometry and a combination of solid and liquid state  $^{13}\text{C}$  and  $^{15}\text{N}$  nuclear magnetic resonance (NMR), and liquid state  $^1\text{H}$  NMR. Irradiation of TNT in the aqueous phase generated dramatically more photolysis products than were previously reported. The most prominent nitrogen-containing functional groups, exclusive of unreacted nitro groups, were azoxy, amide, nitrile, and azo nitrogens. Results suggest that Composition B photolysis, particularly the TNT component, generates a dynamic mixture of products and ions beginning on the solid surfaces before dissolution, and increasing once in solution phase.

DTIC

*Degradation; Photochemical Reactions; Photodecomposition*

**20080000845** NASA Langley Research Center, Hampton, VA, USA

**Spectroscopic Detection of COClF in the Tropical and Mid-Latitude Lower Stratosphere**

Rinsland, Curtis P.; Nassar, Ray; Boone, Chris D.; Bernath, Peter; Chiou, Linda; Weisenstein, Debra K.; Mahieu, Emmanuel; Zander, Rodolphe; [2007]; 10 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 281945.02.32.01.07; Copyright; Avail.: CASI: [A02](#), Hardcopy

We report retrievals of COClF (carbonyl chlorofluoride) based on atmospheric chemistry experiment (ACE) solar occultation spectra recorded at tropical and mid-latitudes during 2004-2005. The COClF molecule is a temporary reservoir of both chlorine and fluorine and has not been measured previously by remote sensing. A maximum COClF mixing ratio of  $99.7 \pm 48.0$  pptv ( $10(\text{exp } -12)$  per unit volume, 1 sigma) is measured at 28km for tropical and subtropical occultations (latitudes below 20deg in both hemispheres) with lower mixing ratios at both higher and lower altitudes. Northern hemisphere mid-latitude mixing ratios (30-50degN) resulted in an average profile with a peak mixing ratio of  $51.7 \pm 32.1$  pptv, 1 sigma, at 27 km, also decreasing above and below that altitude. We compare the measured average profiles with the one reported set of in situ lower stratospheric mid-latitude measurements from 1986 and 1987, a previous two-dimensional (2-D) model calculation for 1987 and 1993, and a 2-D-model prediction for 2004. The measured average tropical profile is in close agreement with the model prediction; the northern mid-latitude profile is also consistent, although the peak in the measured profile occurs at a higher altitude (2.5-4.5km offset) than in the model prediction. Seasonal average 2-D-model predictions of the COClF stratospheric distribution for 2004 are also reported.

Author

*Carbonyl Compounds; Stratosphere; Atmospheric Chemistry; Tropical Regions; Remote Sensing; Mixing Ratios*

**20080000847** NASA Langley Research Center, Hampton, VA, USA

**Detection of Elevated Tropospheric Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) Mixing Ratios in Atmospheric Chemistry Experiment (ACE) Subtropical Infrared Solar Occultation Spectra**

Rinsland, C. P.; Coheur, P. F.; Herbin, H.; Clerbaux, C.; Boone, C.; Bernath, P.; Chiou, L. S.; [2007]; 9 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 281945.02.32.01.07; Copyright; Avail.: Other Sources

We report measurements of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) profiles from infrared solar occultation spectra recorded at 0.02/cm resolution by the atmospheric chemistry experiment (ACE) during 2004 and 2005. Mixing ratios as high as 1.7 ppbv (1 ppbv =  $1 \times 10(\text{exp } -9)$  per unit volume) were measured in the subtropical troposphere. Back trajectories, fire count statistics, and simultaneous measurements of other species from the same occultation provide evidence that the elevated H<sub>2</sub>O<sub>2</sub> mixing ratios originated from a young biomass-burning plume. The ACE time series show only a few cases with elevated H<sub>2</sub>O<sub>2</sub> mixing ratios likely because of the short lifetime of H<sub>2</sub>O<sub>2</sub> and the limited sampling during biomass-burning time periods.

Author

*Hydrogen Peroxide; Solar Spectra; Occultation; Atmospheric Chemistry; Mixing Ratios; Remote Sensing*

**20080000914** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

**Mesa Etching Characterization of InSb for High Density Image Array Applications**

Chang, Kow-Ming; Luo, Jiunn-Jye; Chiang, Chen-Der; Liu, Kou-Chen; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 11-16; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

The wet etching characteristics of InSb single crystal were investigated for high-density focal plane array applications. Two different chemical systems were used to prepare the mesa structures using standard lithography. The wet etching characteristics corresponding to these chemical systems were measured and analyzed. The results can be used to identify the

dominant control mechanisms during the etching process. The etching conditions such as the chemical concentration will influence the etching characteristics, the effects of which lead to our understanding the dominant control mechanism after optimizing different ratios of wet etching chemicals. Citric acid/peroxide has been shown to produce a practical etching rate at room temperature. The dominant control mechanism for InSb mesa etching in citric acid/peroxide is surface reaction rate-limit oriented, in that it depicts promising potential in morphology and sidewall profile control for InSb mesa type device applications. To verify the feasibility of these processes for device applications, a field emission scanning electron microscope was used to analyze the step coverage for dielectric deposition and metal layer coating. To meet the requirements of InSb high density array applications, a peroxide based chemical system with reaction rate-limit mechanism was concocted to bring to produce superior etching performance in comparison with a nitric acid based solution.

Author

*Chemical Composition; Etching; Focal Plane Devices; Etchants; Indium Antimonides*

**20080000996** Princeton Univ., NJ USA

**Knowledge Oriented Materials Engineering of Layered Thermal Barrier Systems (NOMELT)**

Srolowitz, David; Hemker, Kevin; Evans, Anthony; Hutchinson, John; Pollock, Tresa; Smith, John; Dec 31, 2006; 13 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0163; FA9500-05-1-0173

Report No.(s): AD-A472622; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472622>

A team from academia, Air Force laboratories and industry has been assembled to develop a design code for one of the prevailing failure modes in thermal barrier systems used for aero-turbines. The failure mechanism to be addressed occurs in systems with two-phase bond coats and is manifest as abrupt delamination along the interface between the thermally grown oxide (TGO) and the intermetallic bond coat. The code will integrate several important time/cycle dependent phenomena, each with associated constituent models for: interface adhesion, bond coat deformation, sintering in the thermal barrier layer, etc. In this the second year of the project, efforts have focused on experimental characterization of the various layers and the development of hierarchical models, both of which are needed to characterize and define the salient governing phenomena. A previously developed interfacial delamination model is being adapted for this problem, and integration of these efforts will provide the pathway to the TBC design code.

DTIC

*Computer Aided Design; Computer Programs; Delaminating; Expert Systems; Knowledge Representation; Mathematical Models; Microstructure*

**20080000998** Woods Hole Oceanographic Inst., MA USA

**The Temporal Dynamics of Terrestrial Organic Matter Transfer to the Oceans: Initial Assessment and Application**

Drenzek, Nicholas J; Jun 2007; 225 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): OCE-9907129; OCE-052626800

Report No.(s): AD-A472625; MIT/WHOI-2007-14; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472625>

This thesis employs compound-specific stable carbon and radiocarbon isotopic analysis of organic biomarkers to (a) resolve petrogenic from pre-aged vascular plant organic carbon (OC) in continental margin sediments, (b) investigate the underlying mechanisms controlling the anomalously old ages that are often observed for the terrestrial component of sedimentary OC, and (c) address the associated consequences for biomarker-based climate reconstructions. In Chapters 2 and 3, coupled molecular isotope mass balances demonstrate that the amount of petrogenic OC residing on the Beaufort Shelf (Arctic Ocean) and the Eel River Margin (coastal California) has been previously overestimated due to the presence of significantly 'pre-aged' terrestrial OC. However, even though the contribution of organic matter emanating from sedimentary rocks may be smaller, these results reinforce the emerging notion that it is not completely oxidized during weathering and subsequent seaward transport. In Chapter 4, comparison of the down-core radiocarbon profiles for certain vascular plant biomarkers extracted from Cariaco Basin (Caribbean Sea) and Saanich Inlet (coastal British Columbia) sediments with the radiocarbon evolution of atmospheric carbon dioxide reveals that the vast majority of the terrestrial OC experiences multi-millennial residence times on land prior to entering the sea. Most of the remaining inventory is deposited in sediments within one or two decades, providing direct evidence that very little terrestrial organic matter is rapidly transferred to the marine environment. With this in mind, the striking modulation in the signal amplitude of a biomarker-based tropical

paleoaridity record presented in Chapter 5 was instead used to evaluate the role of low versus high latitude forcing in abrupt paleoclimate oscillations during the last full glacial cycle.

DTIC

*Carbon 14; Chronology; Marine Environments; Organic Materials; Paleoclimatology; Time Measurement*

**20080001039** Army Research Lab., Aberdeen Proving Ground, MD USA

**New Outlook on the High-Pressure Behavior of Pentaerythritol Tetranitrate**

Ciezak, Jennifer A; Jenkins, Timothy A; Sep 2007; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472710; ARL-TR-4238; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472710>

To gain insight into the high-pressure behavior of pentaerythritol tetranitrate ( $C(CH_2ONO_2)_4$ ), single crystal Raman spectroscopy results were obtained for hydrostatic/quasi-hydrostatic and non-hydrostatic compression in a diamond anvil cell. Detailed analyses of the pressure-induced changes in the single-crystal/neon hydrostatic media revealed the splitting of several vibrational modes and many intensity fluctuations, which provide strong evidence for a pressure-induced symmetry modification from S4 to D2 rather than a high-pressure phase transition. Near 14.8 GPa, many vibrational features disappeared or significantly broadened. These spectral modifications were coincident with the appearance of cracks in the single crystal, which are believed to result from an elastic-plastic deformation attributable to slip plane activation. The effect of pressure media on the high-pressure behavior was also studied. The onset pressure of the S4 to D2 symmetry modification was found to be strongly dependent on the pressure media, but all single crystal samples that survived to 14.8 GPa were subject to the elastic-plastic deformation. If the pressure in the diamond anvil cell did not exceed 14.5 GPa, the samples could be quenched and recovered at ambient pressure; however, once the pressure exceeded 14.5 GPa and the slip planes became activated, the samples decomposed upon return to ambient conditions.

DTIC

*Diamonds; Elastic Properties; High Pressure; Hydrostatics; PETN; Raman Spectra; Single Crystals*

**20080001054** Army Research Lab., Aberdeen Proving Ground, MD USA

**Evaluation of Chemical Agent Resistant Coatings that are Exposed to Ultraviolet Radiation**

Lum, William S; Kidd, Jr, James A; Aug 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-AH84

Report No.(s): AD-A472744; ARL-TN-285; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472744>

The U.S. Army Research Laboratory (ARL) has the lead research and development responsibility for chemical agent resistant coatings (CARC) and manages the relevant specifications that govern the topcoats, primers, and pretreatments for CARC systems. In striving to optimize coating durability and to extend the life cycle of vehicles and weapon systems that use CARC materials, ARL evaluated several CARC topcoats for ultraviolet (UV) resistance. After samples were subjected to UV irradiance in laboratory weathering chambers, several instruments were used to quantify four parameters that indicate the degradation of a material.

DTIC

*Chemical Attack; Coatings; Ultraviolet Radiation*

**20080001225** Defence Research and Development Canada, Toronto, Ontario Canada

**New Advanced Mass Casualty Breathing System for Oxygen Therapy: Phase 1**

Bouak, F; Eaton, D J; Oct 2006; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472985; DRDC-TORONTO-TM-2006-201; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the first phase of a project to develop an efficient mass casualty oxygen (O<sub>2</sub>) breathing system for O<sub>2</sub> therapy in remote areas. In this first phase, DRDC Toronto was tasked to investigate the performance of the Pulmanex Hi-Ox mask (Hi-Ox) at O<sub>2</sub> flow rates from 4 litres per minute (L min<sup>-1</sup>) down to 0.5 L min<sup>-1</sup>. Performance was evaluated with eighteen male and female volunteers between the ages of 21 and 56 years. Subjects were at rest in a seated position. The data showed that it is possible to use the Hi-Ox for O<sub>2</sub> treatment with low flow rates. The peak concentration of inhaled oxygen was 31.7 5.6% at 0.5 L min<sup>-1</sup> and 80.3 7.8% at 4 L min<sup>-1</sup>. To achieve a given level of O<sub>2</sub> concentration, the Hi-Ox required



significantly less O<sub>2</sub> than the commonly used simple facemask. This will allow the use of portable O<sub>2</sub> concentrators to supply oxygen to the Hi-Ox, increasing the efficiency and minimizing risks.

DTIC

*Breathing Apparatus; Casualties; Oxygen; Oxygen Masks*

**20080001255** Superpower, Inc., Schenectady, NY USA

**Research and Development of Coated Conductors Using Metal Organic Chemical Vapor Deposition**

Selvamanickam, V; Sep 2007; 12 pp.; In English

Contract(s)/Grant(s): FA9550-04-C-0020; Proj-2305/GX

Report No.(s): AD-A473046; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is a new 3-year program to build on the success of the previously funded AFOST Contract FA9550-04-C-0020. In the last year of this program, we made major progress in both objectives of the program. We fabricated films of different thickness by our standard MOCVD processes and worked with our collaborators (ORNL, LANL, FSU,) to understand the microstructural reasons for the I<sub>c</sub> performance using a variety of advanced characterization tools. We then modified our MOCVD process using a multipass technique to improve I<sub>c</sub> performance in thick films. We modified rare-earth composition to improve critical current performance. This report addresses progress made in the first 3 months of the new program.

DTIC

*Coatings; Conductors; Metal Vapors; Metals; Organic Chemistry; Vapor Deposition*

**20080001480** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Effect of Pre-Strain on the Dielectric and Dynamic Mechanical Properties of HSIII Silicone**

Szabo, J P; Underhill, R S; Rawji, M; Keough, I A; Jan 2006; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 11GM19

Report No.(s): AD-A472972; DRDC ATLANTIC-TM-2005-251; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study, the mechanical and electrical properties of a silicone polymer were studied as a function of pre strain in order to improve our understanding of dielectric breakdown phenomena in amorphous elastomeric materials. HSIII silicone (Dow Corning) films were prepared and studied by dynamic mechanical analysis, dielectric analysis, and dielectric breakdown experiments. It was found that the storage modulus increased significantly with uniaxial stretch, from 0.4 MPa in the unstretched state to 9.1 MPa at 250% uni-axial pre strain. The mechanical loss factor was unaffected by pre strain. The real and imaginary parts of the complex dielectric permittivity were also unaffected by the application of a biaxial pre strain. For HSIII films with no pre strain applied, the dielectric strength increased with decreasing thickness. The dielectric strength was also found to be strongly dependent on pre strain, with a near doubling of dielectric strength with a 200% uniaxial pre strain applied. A series of experiments carried out over a range of film thicknesses and at two pre strain levels (0% and 200% uniaxial) demonstrated that both pre strain and thickness independently affected the observed breakdown strength, and that pre strain was the more important factor over the thickness range studied (25 430 m).

DTIC

*Dielectric Properties; Dynamic Characteristics; Mechanical Properties; Silicones*

**20080001484** Army Construction Engineering Research Lab., Champaign, IL USA

**Innovative Corrosion-Resistant Coatings for Heat Distribution Piping at Fort Jackson**

Marsh, Charles P; Beitelman, Alfred D; Franks, Ryan J; Jun 2007; 72 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-IMA2

Report No.(s): AD-A472602; ERDC/CERL-TR-07-29; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472602>

Heat distribution systems are an integral part of military facility and installation infrastructure. These systems include numerous manholes that represent weak points in the overall efficiency, reliability, and service life of heating infrastructure. This report discusses the demonstration of an insulating ceramic paint and primer applied to coat manholes, piping, and appurtenances at Fort Jackson, SC, and the results obtained. The ceramic paint helps to prevent corrosion and heat loss while also significantly mitigating hazardous working conditions. Because these issues are important operational concerns for every military facility, ceramic coatings represent an element of building engineering that should be considered for wider adoption in heat distribution systems.

DTIC

*Ceramic Coatings; Cooling; Corrosion Prevention; Corrosion Resistance; Paints*

**20080001493** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Genetic Algorithm Optimization of Multilayer Jaumann Absorbers. Oblique Incidence**

Saville, Paul; Dec 2005; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472943; DRDC-TM-2005-283; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Multilayers of spacers and resistive sheets can produce wide bandwidth microwave absorbers. Absorber bandwidth increases with the number of resistive sheets and the resistance profile through the absorber determines its performance. Absorber design requires an optimisation tool. In this paper absorber design is optimized using the Genetic Algorithm for oblique angles of incidence. The influence of incident angle on absorber bandwidth is studied for 1 to 7-layer absorbers, high permittivity spacers and protective layers. It was found that the bandwidth at normal incidence remains fairly constant to an angle of about 30 degrees. Absorber performance was maintained out to large incident angles if the absorber was designed at the large angle, though at a cost of a thicker absorber.

DTIC

*Broadband; Genetic Algorithms; Microwaves*

**20080001622** Vijay Kumar Foundation, Chennai, India

**Interaction of Gases on Single-Wall Carbon Nanotubes**

Kumar, Vijay; Aug 18, 2006; 17 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0457

Report No.(s): AD-A473070; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473070>

This project is a continuation of the earlier study on Interaction of water and methanol with single wall carbon nanotubes. The objective of the project was to supplement previous work by considering (1) more than one molecule in the interaction, (2) extending the previous work by examining interactions with bundles of carbon nanotubes rather than a single nanotube, (3) comparing interactions within and between nanotubes, and '4' examining effects of nanotube deformation on the interaction. This study is to support the experimental work done using Raman spectroscopy by Prof. Maher Amar of Wright State University in association with Dr. John F. Maguire of the Air Force Research Laboratory. In general the interaction energies of H<sub>2</sub>O and CH<sub>3</sub>OH molecules on a '10,10' SWCNT, C<sub>60</sub> and a graphene sheet are quite small 'a few tens of meV' and it is weakly dependent on the orientation of the molecules. This is presumably due to the large HOMO-LUMO gap '6.2 and 5.58 eV 'GGA' for water and methanol, respectively'. The electronic structures 'gap' of graphene, nanotubes and C<sub>60</sub> differ and this could contribute to the differences. For '10,10' nanotube the interaction energy is more favorable outside '39 meV' the nanotube for water. This energy is significantly lower than the cohesive energy of water and therefore water is suggested to wet the nanotube because two molecules outside a nanotube form a dimer. The interaction energy for a dimer 'see table below' also increases as compared to a single molecule. On the other hand for methanol the interaction energy for the two cases, outside as well as inside, is nearly the same, though the value remains small '40 meV'. It is predicted that the competition between the molecules and molecule-nanotube wall could lead to interesting ordering in the nanotube which could depend on the size of the nanotube.

DTIC

*Carbon Nanotubes; Methyl Alcohol; Molecules; Walls*

**20080001690** Federal Aviation Administration, Oklahoma City, OK USA

**Postmortem Ethanol Testing Procedures Available to Accident Investigators**

Canfield, Dennis V; Brink, James D; Johnson, Robert D; Lewis, Russell J; Dubowski, Kurt M; Aug 2007; 10 pp.; In English  
Report No.(s): AD-A473197; DOT/FAA/AM-07/22; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473197>

An ethanol positive fatal case reported as being from ingestion was ultimately determined to be from postmortem ethanol production using the ratio of two serotonin metabolites found in urine. This case involved a transportation accident that could have resulted in additional hardships for the victim's family through loss of compensation and reputation.

DTIC

*Ethyl Alcohol; Motor Vehicles*

**20080001886** Little (Arthur D.), Inc., Cambridge, MA USA

**Implementation of Plastic Media Blasting (PMB) at US Army Depots**

Balasco, A A; Lindstrom, R S; Bowen, R C; Scholl, C C; Jan 1988; 221 pp.; In English

Contract(s)/Grant(s): DAAK11-85-D-0008-0009

Report No.(s): AD-A473332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objectives of Task Order Number 9, entitled 'Implementation of Plastic Media Blasting,' under U.S. Army Toxic and Hazardous Material Agency (USATHAMA), Contract No. DAAK11-85-D-0008, were fourfold: (1) Evaluate current depainting practices at U.S. Army depots; (2) Evaluate the state of the art in plastic media blasting (PMB); (3) Provide guidance and recommendations to the U.S. Army for implementation of PMB technology in lieu of or in addition to existing depainting operations where PMB is technically, environmentally, and economically justified; and (4) Prepare a test plan to address areas identified during the study as requiring additional data.

DTIC

*Abrasives; Composite Materials; Paints*

**20080002398** Stanford Univ., Stanford, CA USA

**Materials Science of High-Temperature Superconducting Coated Conductor Materials**

Beasley, M R; Oct 2007; 4 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0108; Proj-2305

Report No.(s): AD-A473578; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473578>

This program was broadly focused on the materials science of high temperature superconducting coated conductors, which are of potential interest for application in electric power systems of interest to the Air Force. The three main elements of the program were as follows: (1) understanding the basic materials science underlying the deposition of 123 YBCO at the high rates needed for economic manufacture of coated conductors; (2) exploration of variants of and alternatives to 123 YBCO for possible application as coated conductors; and (3) (in the early parts of the program) development and application of in situ deposition process monitoring tools relevant to coated conductor deposition. Each of these topics is discussed in turn. In addition, other topics are addressed as special opportunities that presented themselves as the program evolved.

DTIC

*Coatings; Conductors; Deposition; High Temperature Superconductors; Superconductors (Materials); Thin Films*

**20080002579** General Dynamics Advanced Information Systems, Dayton, OH USA

**Measurement of Thermal Properties of Infrared Materials (Preprint)**

Guha, Shekhar; Heckman, Emily M; Gonzalez, Leonel P; May 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473737; AFRL-ML-WP-TP-2007-511; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The thermal properties of several semiconductors including InAs, InSb, Si and HgCdTe have been measured using the laser flash method. The values of the thermal diffusivity, specific heat, and thermal conductivity are reported for these materials at temperatures ranging from 90 to 400K.

DTIC

*Infrared Radiation; Thermodynamic Properties*

**20080002591** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Triplet Excimer Formation in a Platinum Acetylide (Preprint)**

Cooper, Thomas M; Urbas, Augustine M; Slagle, Jonathan E; Krein, Douglas M; Rogers, Joy E; McLean, Daniel G; Apr 2007; 21 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473753; AFRL-ML-WP-TP-2007-493; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To prove the source of ground state self-quenching in trans-Pt(P(C<sub>8</sub>H<sub>17</sub>)<sub>3</sub>)<sub>2</sub>(C=CC<sub>6</sub>H<sub>4</sub>C=CC<sub>6</sub>H<sub>5</sub>)<sub>2</sub> is a result of triplet excimer formation, we carried out nanosecond transient absorption measurements on multiple concentrations. By constructing a kinetic model for the system we were able to determine rate constants for the formation and decay of the triplet excimer, 4.7 x 10<sup>6</sup> M<sup>-1</sup>s<sup>-1</sup> and 6.9 x 10<sup>5</sup> s<sup>-1</sup> respectively. We determined the transient absorption spectrum for the excimer which has

an extinction coefficient maximum per excimer unit of 95,680 M<sup>-1</sup>cm<sup>-1</sup> at 600nm. Experimental analysis suggests that the formation of the triplet excimer is largely due to a ligand to ligand interaction.

DTIC

*Acetylene; Atomic Energy Levels; Excimers; Platinum*

**20080002645** Universal Energy Systems, Inc., Dayton, OH USA

**Insight into the Nonlinear Absorbance of Two Related Series of Two-Photon Absorbing Chromophores (Postprint)**

Jakubiak, Rachel; Tan, Loon-Seng; Fleitz, Paul A; Pachter, Ruth; Rogers, Joy E; Slagle, Jonathan E; McLean, Daniel G; Sutherland, Richard L; Brant, Mark C; Heinrichs, James; Kannan, Ramamurthi; Jan 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473839; AFRL-ML-WP-TP-2007-561; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A comprehensive photophysical study of the linear and nonlinear absorption properties has been carried out on two series of two-photon absorbing dyes to gain insight into how structure-property relationships influence observed nonlinear absorption. The materials studied consist of an electron accepting benzothiazole group connected to an electron donating diphenylamine via a fluorene bridging group. Two series differ from each other by the addition of one phenyl group and for each series one-arm (dipolar, AF240 and AF270), two-arm (quadrupolar, AF287 and AF295), and three-arm (octupolar, AF350 and AF380) versions were studied. Overall the AF240 series exhibits higher intrinsic two-photon absorption (TPA) cross-sections than the AF270 series as well as enhanced nanosecond nonlinear absorption, with an increase with number of branches. The enhanced nanosecond nonlinearity is understood by taking into account the contribution from the singlet and triplet excited states and was verified by a two-photon assisted excited-state absorption model that satisfactorily predicts the nonlinear absorption of the chromophores.

DTIC

*Chromophores; Nonlinear Systems; Nonlinearity; Photons*

**20080002646** Beam Engineering for Advanced Measurements Co., Winter Park, FL USA

**Optical Tuning of the Reflection of Cholesterics Doped with Azobenzene Liquid Crystals (Postprint)**

Bunning, Timothy J; Hrozhyk, Uladzimir A; Serak, Svetlana V; Tabiryan, Nelson V; Jan 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473841; AFRL-ML-WP-TP-2007-547; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mixtures of cholesteric liquid crystals doped with high clearing temperature azobenzene nematic liquid crystals are shown to possess large, fast, and reversible dynamic photosensitive features. Selective wavelength shifts approaching 400 nm are reported, and depending on the host cholesteric liquid crystal, both red-shifted and blue-shifted wavelength changes can be induced. The photoinduced states of these material systems are shown to be stable for long periods of time upon removal of the radiation source, completely reversible, and dynamically fast. These phototunable features are demonstrated using both continuous wave (CW) and nanosecond laser beams. The latter is used to change the selective reflection wavelength from blue to green with a single nanosecond pulse and the ability to write information into these films using these processes are demonstrated.

DTIC

*Cholesterol; Doped Crystals; Liquid Crystals; Optical Properties; Optical Reflection; Photosensitivity; Tuning*

**20080002817** Defence Research and Development Suffield, Suffield, Alberta Canada

**Pyridinium Oxime Compounds as Antimicrobial Agents**

Berger, Bradley J; Knodel, Marvin H; Aug 2007; 36 pp.; In English

Report No.(s): AD-A473567; DRDC-S-TM-2007-176; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473567>

Pyridinium oxime compounds have been utilised by a number of military organisations as one of the antidotes for nerve-agent poisoning. In Canada, the preferred compound from this class is HI-6, which has been demonstrated to be tolerated at high doses without significant ill effects. In this study, HI-6 and 15 structural analogues have been examined for their antimicrobial properties against a series of model organisms: *Bacillus cereus* and *B. anthracis* Sterne (as models for virulent *B. anthracis*), *Ochrobactrum intermedium* (as a model for *Brucella* spp.), *Mycobacterium marinum* (as a model for *M. tuberculosis*), and *Crithidia luciliae* (as a model for *Leishmania* spp.). In general, the compounds were found to have little

to no antimicrobial effect, with KJD-2-11, a thiourea derivative, being the most active in all the test systems.  
DTIC

*Antibiotics; Antiinfectives and Antibacterials; Microorganisms; Pyridines*

**20080012212** Horizons Research, Inc., Cleveland, OH USA

**Curable polyphosphazene copolymers and terpolymers**

Reynard, Kennard A., Inventor; Rose, Selwyn H., Inventor; April 6, 1976; 6 pp.; In English

Patent Info.: Filed August 7, 1974; US-PATENT-3,948,820; US-PATENT-APPL-SN-495464; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012212>

Copolymers and terpolymers comprising randomly repeating units represented by the general formulae ##EQU1## wherein the R' radicals contain OH functionality and R being at least one member of the group of monovalent radicals selected from alkyl, substituted alkyl, aryl, substituted aryl and arylalkyl, and R' is represented by ##EQU2## wherein Q represents either --(CH.sub.2).sub. n or --C.sub.6 H.sub.4 X(CH.sub.2).sub. m, the --X(CH.sub.2).sub. m group being either meta or para and n is an integer from 1 to 6, m is an integer from 1 to 3, X is O or CH.sub.2, and R is H or a lower alkyl radical with up to four carbon atoms (methyl, ethyl, etc.). The ratio of R to R' is between 99.5 to 0.5 and 65 to 35.

Official Gazette of the U.S. Patent and Trademark Office

*Copolymers; Alkyl Compounds; Radicals; Hydrocarbons*

**20080012213** Manlabs, Inc., Cambridge, MA USA

**Ternary boride product and process**

Clougherty, Edward V., Inventor; February 10, 1976; 5 pp.; In English

Contract(s)/Grant(s): NASW-2088

Patent Info.: Filed September 27, 1973; US-PATENT-3,937,619; US-PATENT-APPL-SN-401291; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012213>

A hard, tough, strong ceramic body is formed by hot pressing a mixture of a powdered metal and a powdered metal diboride. The metal employed is zirconium, titanium or hafnium and the diboride is the diboride of a different member of the same group of zirconium, titanium or hafnium to form a ternary composition. During hot pressing at temperatures above about 2,000.degree.F., a substantial proportion of acicular ternary monoboride is formed.

Official Gazette of the U.S. Patent and Trademark Office

*Borides; Ceramics; Hot Pressing; Metal Powder*

**20080012233** Electron Emission Systems, Inc., Tucson, AZ USA

**Low-temperature thermionic emitter**

Remington, Richard W., Inventor; September 27, 1977; 6 pp.; In English

Patent Info.: Filed June 13, 1975; US-PATENT-4,051,272; US-PATENT-APPL-SN-586592; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012233>

An improved photodelineatable cathode material is disclosed comprising a combination of triple carbonate (TC) and a hydrocarbon polymeric photoresist PR. A mixture of TC powder and PR is applied to a cathode by spraying, spinning or dipping and is then subjected to activation at a temperature from about 800.degree. C up to the melting temperature. The cathodes can be activated at a temperature as low as 800.degree. C and still deliver a 0-field, temperature-limited current density of 750 milliamperes per sq. centimeter at 600.degree. C. If a pattern is desired, the coating is exposed through a suitable mask to actinic light to harden the photoresist in the desired areas. Following exposure, the exposed image areas are developed and the unexposed portions of the coating are removed with solvent. When dry, the cathode is ready for activation.

Official Gazette of the U.S. Patent and Trademark Office

*Carbonates; Cathodes; Hydrocarbons; Photoresists; Thermionic Emitters*

**20080012234** Dow Chemical Co., Midland, MI USA

**Ferrule and use thereof for cooling a melt spun hollow glass fiber as it emerges from a spinnerette**

Brown, William E., Inventor; September 27, 1977; 11 pp.; In English

Contract(s)/Grant(s): NAS18525

Patent Info.: Filed October 4, 1976; US-PATENT-4,050,915; US-PATENT-APPL-SN-729440; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012234>

An improvement in the process of melt spinning thin walled, hollow fibers from relatively low melting glasses results if cooling of the emerging fiber is accomplished by use of a thin layer of gas to transfer heat from the fiber to a ferrule which fits closely to the spinnerette face and the individual fiber. The ferrule incorporates or is in contact with a heat sink and is slotted or segmented so that it may be brought into position around the moving fiber. Thinner walled, more uniform fibers may be spun when this method of cooling is employed.

Official Gazette of the U.S. Patent and Trademark Office

*Cooling; Glass; Glass Fibers; Melt Spinning; Melting*

**20080012236** California Inst. of Tech., Pasadena, CA USA

**Crosslinked, porous, polyacrylate beads**

Rembaum, Alan, Inventor; Yen, Shiao-Ping S., Inventor; Dreyer, William J., Inventor; September 6, 1977; 4 pp.; In English

Patent Info.: Filed May 30, 1975; US-PATENT-4,046,720; US-PATENT-APPL-SN-582134; No Copyright; Avail.: CASI:

A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012236>

Uniformly-shaped, porous, round beads are prepared by the co-polymerization of an acrylic monomer and a cross-linking agent in the presence of 0.05 to 5% by weight of an aqueous soluble polymer such as polyethylene oxide. Cross-linking proceeds at high temperature above about 50.degree. C or at a lower temperature with irradiation. Beads of even shape and even size distribution of less than 2 micron diameter are formed. The beads will find use as adsorbents in chromatography and as markers for studies of cell surface receptors.

Official Gazette of the U.S. Patent and Trademark Office

*Acrylic Resins; Beads; Crosslinking; Monomers; Polymerization; Porosity*

**20080012240** California Inst. of Tech., Pasadena, CA USA

**Conductive hydrogel containing 3-ionene**

Rembaum, Alan, Inventor; Yen, Shiao-Ping Siao, Inventor; July 19, 1977; 10 pp.; In English

Patent Info.: Filed December 26, 1973; US-PATENT-4,036,808; US-PATENT-APPL-SN-427917; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012240>

Cationic polyelectrolytes formed by the polymerization in absence of oxygen of a monomer of the general formula: dispersed ##STR1## where x is 3 or more than 6 and Z is I, Br or Cl to form high charge density linear polymers are dispersed in a water-soluble polymer such as polyvinyl alcohol to form a conductive hydrogel.

Official Gazette of the U.S. Patent and Trademark Office

*Electrolytes; Monomers; Oxygen; Polymerization*

**20080012241** California Inst. of Tech., Pasadena, CA USA

**Cell specific, variable density, polymer microspheres**

Yen, Shiao-Ping S., Inventor; Rembaum, Alan, Inventor; Molday, Robert S., Inventor; July 12, 1977; 6 pp.; In English

Patent Info.: Filed November 24, 1975; US-PATENT-4,035,316; US-PATENT-APPL-SN-634929; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012241>

Biocompatible polymeric microspheres having an average diameter below about 3 microns and having density at least 15% greater or lesser than organic cells and having covalent binding sites are provided in accordance with this invention. The microspheres are obtained by copolymerizing a hydroxy or amine substituted acrylic monomer such as hydroxyethylmethacrylate with a light or dense comonomer such as a fluoromonomer. A lectin or antibody is bound to the hydroxy or amine site of the bead to provide cell specificity. When added to a cell suspension the marked bead will specifically

label the cell membrane by binding to specific receptor sites thereon. The labelled membrane can then be separated by density gradient centrifugation.

Official Gazette of the U.S. Patent and Trademark Office

*Chemical Bonds; Covalence; Microparticles*

**20080012243** Pennwalt Corp., Philadelphia, PA USA

**Aqueous vinylidene fluoride polymer coating composition**

Bartoszek, Edward J., Inventor; Christofas, Alkis, Inventor; December 5, 1978; 4 pp.; In English

Contract(s)/Grant(s): NAS9-14403

Patent Info.: Filed January 21, 1977; US-PATENT-4,128,519; US-PATENT-APPL-SN-761191; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012243>

A water-based coating composition which may be air dried to form durable, fire resistant coatings includes dispersed vinylidene fluoride polymer particles, emulsified liquid epoxy resin and a dissolved emulsifying agent for said epoxy resin which agent is also capable of rapidly curing the epoxy resin upon removal of the water from the composition.

Official Gazette of the U.S. Patent and Trademark Office

*Coating; Drying; Durability; Epoxy Resins; Fires; Fluorides; Vinylidene*

**20080012244** California Inst. of Tech., Pasadena, CA USA

**Photochemical preparation of olefin addition catalysts**

Gray, Harry B., Inventor; Rembaum, Alan, Inventor; Gupta, Amitava, Inventor; November 28, 1978; 13 pp.; In English

Patent Info.: Filed January 31, 1977; US-PATENT-4,127,506; US-PATENT-APPL-SN-764402; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012244>

Novel polymer supported catalysts are prepared by photo-irradiation of low valent transition metal compounds such as Co.sub.2 (CO).sub.8, Rh.sub.4 (CO).sub.12 or Ru.sub.3 (CO).sub.12 in the presence of solid polymers containing amine ligands such as polyvinyl pyridine. Hydroformylation of olefins to aldehydes at ambient conditions has been demonstrated.

Official Gazette of the U.S. Patent and Trademark Office

*Alkenes; Catalysts; Irradiation; Photochemical Reactions; Transition Metals*

**20080012245** Shell Oil Co., Houston, TX USA

**Catalyst comprising Ir or Ir and Ru for hydrazine decomposition**

Armstrong, Warren E., Inventor; Ryland, Lloyd B., Inventor; Voge, Hervey H., Inventor; November 7, 1978; 6 pp.; In English

Patent Info.: Filed May 28, 1964; US-PATENT-4,124,538; US-PATENT-APPL-SN-371879; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012245>

A catalyst for hydrazine decomposition consisting essentially of a carrier having a pore volume of at least 0.1 cubic centimeters per gram and a specific surface area, measured in square meters per gram, equal to  $195(C_{sub.p} + 0.013 + 0.736V_{sub.p})$  where  $C_{sub.p}$  is the specific heat capacity of the carrier at about 25.degree. C in calories per gram per degree and  $V_{sub.p}$  is the pore volume of the carrier in cubic centimeters per gram and metal of the group consisting of iridium, and mixtures consisting of iridium and ruthenium deposited on said carrier in an amount between 20% and about 40% by weight of the catalyst and distributed through the pores thereof in discrete particles sufficiently separated from each other so that they do not sinter or fuse together when the catalyst is at hydrazine decomposition temperature.

Official Gazette of the U.S. Patent and Trademark Office

*Catalysts; Decomposition; Hydrazines*

**20080012246** California Inst. of Tech., Pasadena, CA USA

**Impregnated metal-polymeric functional beads**

Rembaum, Alan, Inventor; Volksen, Willi, Inventor; October 31, 1978; 7 pp.; In English

Patent Info.: Filed August 27, 1976; US-PATENT-4,123,396; US-PATENT-APPL-SN-718103; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012246>

Amine containing polymeric microspheres such as polyvinyl pyridine are complexed with metal salts or acids containing

metals such as gold, platinum or iron. After reduction with sodium borohydride, the salt is reduced to finely divided free metal or metal oxides, useful as catalysts. Microspheres containing covalent bonding sites can be used for labeling or separating proteins.

Official Gazette of the U.S. Patent and Trademark Office

*Amines; Beads; Gold; Iron; Metals; Microparticles*

**20080012247** Shell Oil Co., Houston, TX USA

**Hydrazine decomposition and other reactions**

Armstrong, Warren E., Inventor; La France, Donald S., Inventor; Voge, Hervey H., Inventor; October 31, 1978; 8 pp.; In English

Patent Info.: Filed October 26, 1962; US-PATENT-4,122,671; US-PATENT-APPL-SN-234280; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012247>

This invention relates to the catalytic decomposition of hydrazine, catalysts useful for this decomposition and other reactions, and to reactions in hydrogen atmospheres generally using carbon-containing catalysts.

Official Gazette of the U.S. Patent and Trademark Office

*Carbon; Catalysts; Decomposition; Hydrazines; Hydrogen*

**20080012248** General Electric Co., Schenectady, NY USA

**Oxidation corrosion resistant superalloys and coatings**

Jackson, Melvin R., Inventor; Rairden, III, John R., Inventor; September 26, 1978; 7 pp.; In English

Patent Info.: Filed November 4, 1976; US-PATENT-4,117,179; US-PATENT-APPL-SN-738649; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012248>

An article of manufacture having improved high temperature oxidation and corrosion resistance comprising: (a) a superalloy substrate containing a carbide reinforcing phase, and (b) a coating consisting of chromium, aluminum, carbon, at least one element selected from iron, cobalt or nickel, and optionally an element selected from yttrium or the rare earth elements.

Official Gazette of the U.S. Patent and Trademark Office

*Carbides; Coating; Corrosion Resistance; Heat Resistant Alloys; High Temperature; Oxidation; Oxidation Resistance*

**20080012252** California Inst. of Tech., Pasadena, CA USA

**Cell specific, variable density, polymer microspheres**

Yen, Shiao-Ping S., Inventor; Rembaum, Alan, Inventor; Molday, Robert S., Inventor; August 8, 1978; 5 pp.; In English

Patent Info.: Filed February 3, 1977; US-PATENT-4,105,598; US-PATENT-APPL-SN-765453; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012252>

Biocompatible polymeric microspheres having an average diameter below about 3 microns and having a density at least 15% greater or lesser than organic cells and having covalent binding sites are provided in accordance with this invention. The microspheres are obtained by copolymerizing a hydroxy or amine substituted acrylic monomer such as hydroxyethylmethacrylate with a light or dense comonomer such as a fluoromonomer. A lectin or antibody is bound to the hydroxy or amine site of the bead to provide cell specificity. When added to a cell suspension the marked bead will specifically label the cell membrane by binding to specific receptor sites thereon. The labelled membrane can then be separated by density gradient centrifugation.

Official Gazette of the U.S. Patent and Trademark Office

*Chemical Bonds; Covalence; Microparticles*

**20080012253** California Inst. of Tech., Pasadena, CA USA

**Novel polyelectrolytes**

Rembaum, Alan, Inventor; Yen, Shiao-Ping Siao, Inventor; July 25, 1978; 10 pp.; In English



Patent Info.: Filed January 21, 1976; US-PATENT-4,102,827; US-PATENT-APPL-SN-650910; No Copyright; Avail.: CASI: A02, Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012253>

Cationic polyelectrolytes are formed by the polymerization in absence of oxygen of a monomer of the general formula: ##STR1## where x is 3 or more than 6 and Z is I, Br or Cl to form high charge density linear polymers. Segments of the linear polymer may be attached to or formed in the presence of polyfunctional reactive tertiary amines or halogen polymeric substrates or polyfunctional lower molecular reactive polyfunctional substrates to form branched or star polyelectrolytes by a quaternization polymerization reaction.

Official Gazette of the U.S. Patent and Trademark Office

*Density (Number/Volume); Electric Charge; Electrolytes; Monomers; Oxygen; Polymerization*

**20080012265** California Inst. of Tech., Pasadena, CA USA

#### **Polyvinyl pyridine microspheres**

Rembaum, Alan, Inventor; Gupta, Amitava, Inventor; Volksen, Willi, Inventor; October 9, 1979; 8 pp.; In English

Patent Info.: Filed March 22, 1977; US-PATENT-4,170,685; US-PATENT-APPL-SN-780007; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012265>

Microspheres are produced by cobalt gamma radiation initiated polymerization of a dilute aqueous vinyl pyridine solution. Addition of cross-linking agent provides higher surface area beads. Addition of monomers such as hydroxyethylmethacrylate acrylamide or methacrylamide increases hydrophilic properties and surface area of the beads. High surface area catalytic supports are formed in the presence of controlled pore glass substrate.

Official Gazette of the U.S. Patent and Trademark Office

*Aqueous Solutions; Cobalt; Gamma Rays; Microparticles; Polymerization; Pyridines; Vinyl Polymers*

**20080012269** California Inst. of Tech., Pasadena, CA USA

#### **Enhancement of polyisoprene latex production**

Bauman, Albert J., Inventor; July 3, 1979; 4 pp.; In English

Patent Info.: Filed July 27, 1977; US-PATENT-4,159,903; US-PATENT-APPL-SN-819263; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012269>

Production of high molecular weight polyisoprene latex is enhanced by administering to plants, particularly Guayule Plants, an amine containing at least one two-carbon chain substituent and preferably substituted trialkylamine of the general structure: ##STR1## where R.sub.4, R.sub.5 and R.sub.6 are alkyl, preferably ethyl and at least one of R.sub.4, R.sub.5 and R.sub.6 is preferably an electron withdrawing group substituted aryloxy or arylthio ethyl group.

Official Gazette of the U.S. Patent and Trademark Office

*Amines; Augmentation; Ethyl Compounds; Guayule; Latex; Molecular Weight; Polyisoprenes*

**20080012270** California Inst. of Tech., Pasadena, CA USA

#### **Metal containing polymeric functional microspheres**

Yen, Shiao-Ping S., Inventor; Rembaum, Alan, Inventor; Molday, Robert S., Inventor; June 5, 1979; 11 pp.; In English

Patent Info.: Filed April 20, 1977; US-PATENT-4,157,323; US-PATENT-APPL-SN-789268; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012270>

Polymeric functional microspheres containing metal or metal compounds are formed by addition polymerization of a covalently bondable olefinic monomer such as hydroxyethylmethacrylate in the presence of finely divided metal or metal oxide particles, such as iron, gold, platinum or magnetite, which are embedded in the resulting microspheres. The microspheres can be covalently bonded to chemotherapeutic agents, antibodies, or other proteins providing a means for labeling or separating labeled cells. Labeled cells or microspheres can be concentrated at a specific body location such as in the vicinity of a malignant tumor by applying a magnetic field to the location and then introducing the magnetically attractable microspheres or cells into the circulatory system of the subject. Labeled cells can be separated from a cell mixture by applying a predetermined magnetic field to a tube in which the mixture is flowing. After collection of the labeled cells, the magnetic field is discontinued and the labeled sub-cell population recovered.

Official Gazette of the U.S. Patent and Trademark Office

*Bonding; Microparticles; Monomers; Polymerization*

**20080012277** Radio Corp. of America, New York, NY USA

**Sprayable titanium composition**

Tracy, Chester E., Inventor; Kern, Werner, Inventor; Vibronek, Robert D., Inventor; December 23, 1980; 3 pp.; In English  
Contract(s)/Grant(s): NAS7-100; JPL-954868

Patent Info.: Filed October 10, 1978; US-PATENT-4,241,108; US-PATENT-APPL-SN-950167; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012277>

The addition of 2-ethyl-1-hexanol to an organometallic titanium compound dissolved in a diluent and optionally containing a lower aliphatic alcohol spreading modifier, produces a solution that can be sprayed onto a substrate and cured to form an antireflection titanium oxide coating having a refractive index of from about 2.0 to 2.2.

Official Gazette of the U.S. Patent and Trademark Office

*Alcohols; Compound A; Diluents; Ethyl Compounds; Organometallic Compounds; Spreading; Titanium; Titanium Compounds*

**20080012280** General Electric Co., Schenectady, NY USA

**Oxidation corrosion resistant superalloys and coatings**

Jackson, Melvin R., Inventor; Rairden, III, John R., Inventor; December 2, 1980; 7 pp.; In English

Patent Info.: Filed June 16, 1978; US-PATENT-4,237,193; US-PATENT-APPL-SN-916222; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012280>

An article of manufacture having improved high temperature oxidation and corrosion resistance comprising: (a) a superalloy substrate containing a carbide reinforcing phase, and (b) a coating consisting of chromium, aluminum, carbon, at least one element selected from iron, cobalt or nickel, and optionally an element selected from yttrium or the rare earth elements.

Official Gazette of the U.S. Patent and Trademark Office

*Carbides; Coating; Corrosion Resistance; Heat Resistant Alloys; High Temperature; Oxidation; Oxidation Resistance*

**24**

**COMPOSITE MATERIALS**

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

**2008000606** California Univ., Los Angeles, CA USA

**Nanocomposites for Enhanced Structural Integrity**

Hahn, H T; Sep 11, 2007; 12 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0414

Report No.(s): AD-A472405; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main objective of the proposed research was to develop the science base necessary for full utilization of nanoreinforcements into polymers and fiber composites to improve mechanical, thermal and electrical properties. Two types of nanoreinforcements were studied: 0-dimensional SiC nanoparticles and 2-dimensional graphite nanoplatelets. As property improvements are possible only when the nanoreinforcements are uniformly dispersed in and well bound to the polymer matrix, the emphasis was on developing methods to optimally functionalize these nanoreinforcements. A coupling agent methacryloxy propyl trimethoxy silane (MPS) was found to be effective for the SiC nanocomposite. As for the graphite nanoplatelets, the effects of the following parameters on properties were investigated: size reduction through vibratory milling, thickness reduction through intercalation/expansion/exfoliation, and oxidation through nitric acid treatment. The most effective parameter was found to be the proper oxidation by acid treatment. Material properties studied were tensile strength and modulus, flexural strength and modulus, thermal conductivity, and electrical conductivity. The effects of adding GNPs into fiber composites as well as of using thinner prepreg plies were also studied to a limited extent. The properly oxidated GNPs were found to improve not only mechanical properties but also thermal and electrical properties of GNP/epoxy nanocomposites.

DTIC

*Fiber Composites; Graphite; Gross National Product; Nanocomposites; Nanostructures (Devices); Polymers; Silicon Carbides; Structural Failure*

**2008000607** Massachusetts Inst. of Tech., Cambridge, MA USA

**Defense University Research Initiative on Nanotechnology: Microstructure, Processing and Mechanical Performance of Polymeric Nanocomposites**

Boyce, Mary C; Thomas, Edwin L; Aug 31, 2006; 30 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0447

Report No.(s): AD-A472407; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research was directed towards the development of fundamental understanding of the connections amongst the microstructure, processing and macroscopic properties of polymeric based nanocomposites. Blending of 0-, 1-, and 2-dimensional inorganic fillers such as POSS, carbon nanotubes, and nano-clay platelets into polymeric matrices enabled exploration of various filler/matrix combinations on mechanical properties.

DTIC

*Composite Materials; Mechanical Properties; Microstructure; Nanocomposites; Nanostructures (Devices)*

**2008000637** Illinois Univ. at Urbana-Champaign, Urbana, IL USA

**Self-Healing composites for Mitigation of Impact Damage in US Army Applications**

White, Scott R; Patel, Amit; Dec 1976; 9 pp.; In English

Contract(s)/Grant(s): W911NF-06-2-0003

Report No.(s): AD-A472491; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study, fiber-reinforced composites with self-healing, polymeric matrices are under investigation for mitigation of impact-induced damage. Following the work of White et al. (2001) and Rule et al. (2005), the self-healing properties are engineered into the composite through the inclusion of urea-formaldehyde microcapsules containing dicyclopentadiene (DCPD) liquid healing agent and paraffin wax microspheres containing 10 wt% Grubbs' catalyst. Under low-velocity impact, it is found that self-healing materials are able to repair kissing delaminations, leading to a 51% reduction in damage quantified by a simplified visual technique. Ballistic testing using steel fragment simulating projectiles (FSPs) on composites shows damage modes comparable to the low-rate impact mechanisms. These results suggest that self-healing composites could significantly improve the survivability and sustainability of composite structures in U.S. Army applications.

DTIC

*Fiber Composites; Healing; Impact Damage*

**2008000871** National Inst. of Aerospace, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA

**Metallized Nanotube Polymer Composite (MNPC)**

Park, Cheol; Kim, Jae-Woo; Sauti, Godfrey; Kang, Jin Ho; Lillehei, Peter T.; Lowther, Sharon E.; Harrison, Joycelyn S.; Nazem, Negin; Taylor, Larry; November 29, 2007; 28 pp.; In English; 2007 Materials Research Society (MRS) Fall Meeting, 26-30 Nov. 2007, Boston, MA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NCC-1-02037; Copyright; Avail.: CASI: **A03**, Hardcopy

This viewgraph presentation describes the Metallized Nanotube Polymer Composites (MNPC) used in aerospace vehicles.

CASI

*Metallizing; Carbon Nanotubes; Nanocomposites; Nanotechnology; Polymer Matrix Composites*

**2008000875** NASA Langley Research Center, Hampton, VA, USA

**Overview of NASA Langley's Piezoelectric Ceramic Packaging Technology and Applications**

Bryant, Robert G.; November 27, 2007; 8 pp.; In English; 10th Japan International SAMPE Symposium and Exhibition: JISSE-10, 27-30 Nov. 2007, Tokyo, Japan; Original contains color and black and white illustrations; No Copyright; Avail.:

CASI: **A02**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000875>

Over the past decade, NASA Langley Research Center (LaRC) has developed several actuator packaging concepts designed to enhance the performance of commercial electroactive ceramics. NASA LaRC focused on properly designed actuator and sensor packaging for the following reasons, increased durability, protect the working material from the environment, allow for proper mechanical and electrical contact, afford 'ready to use' mechanisms that are scalable, and develop fabrication methodology applicable to any active material of the same physical class. It is more cost effective to enhance or tailor the performance of existing systems, through innovative packaging, than to develop, test and manufacture new materials. This approach led to the development of several solid state actuators that include THUNDER, the Macrofiber Composite or (MFC) and the Radial Field Diaphragm or (RFD). All these actuators are fabricated using standard materials

and processes derived from earlier concepts. NASA's fabrication and packaging technology as yielded, piezoelectric actuators and sensors that are easy to implement, reliable, consistent in properties, and of lower cost to manufacture in quantity, than their predecessors (as evidenced by their continued commercial availability.) These piezoelectric actuators have helped foster new research and development in areas involving computational modeling, actuator specific refinements, and engineering system redesign which led to new applications for piezo-based devices that replace traditional systems currently in use.

Author

*Piezoelectric Actuators; Packaging; Piezoelectric Ceramics; Cost Effectiveness*

**20080001269** Sophisticated Instruments Center for Applied Research and Testing, Vallabh Vidyanagar, India

**Studies on Enhancing Transverse Thermal Conductivity Carbon/Carbon Composites**

Manocha, Lalit M; Manocha, Satish M; Roy, Ajit; Jul 6, 2007; 6 pp.; In English

Contract(s)/Grant(s): FA5209-06-P-0074

Report No.(s): AD-A473063; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The structure derived potential properties of Graphite such as high stiffness coupled with high thermal conductivity and low coefficient of thermal expansion have been better achieved in Carbon fibers and Carbon-Carbon composites. Consequently, the application domain of carbon-graphite based materials has increased to thermostructural components. These composites are prepared with wide range of reinforcing fibers, high strength carbon fibers to high modulus prepared from PAN, Pitch as well as CVD carbon fibers and carbonaceous material with different compositions as matrix precursor. Both fibers and matrix influence the structure and ultimate properties of carbon/carbon composites. As far as mechanical properties of carbon/carbon composites are concerned the reinforcing carbon fibers are the major load bearing component in carbon-carbon composites. However, the load distribution amongst the fibers through matrix system, the ultimate fracture behaviour and mechanical properties of the composites require judicious control of fiber/matrix interface. Similarly the transport properties like thermal and electrical conductivity depend more on structure and properties of fibers, more so in the direction of the fiber whereas the matrix controls transport properties in the direction perpendicular to reinforcement. The present investigations were undertaken to study thermal properties of the composites and to enhance thermal conductivity of the composites in the direction perpendicular to the fibers through control of matrix microstructure and to study influence of nanocarbon reinforcement addition to the carbonaceous precursors on the microstructure of the matrix as well as on the thermal properties of the ultimate composites. The work incorporated in this report elucidates the thermal conductivity of different types of carbon-carbon composites prepared by the Investigators using different types of carbon fibers and matrix systems.

DTIC

*Carbon-Carbon Composites; Thermal Conductivity*

**20080001270** Maine Univ., Orono, ME USA

**Effect of Processing Parameters on Reliability of VARTM/SCRIMP Composite Panels - Phase 1**

Dagher, Habib J; Lopez-Anido, Roberto; Thompson, Larry; El-Chiti, Fadi; Fayad, Ghassan; Berube, Keith; Jul 2007; 123 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-1-0542; Proj-206

Report No.(s): AD-A473065; 08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Reliability based design and acceptance criteria are currently being developed by the U.S. Navy using Navy load and strength prediction methodologies. However, this work considers only traditional structural materials and systems and a limited range of structural-failure modes. Though limited, this effort represents a significant shift in composite design methodology and assessment of design acceptance and provides a framework used in this program. The structural risks associated with new FRP composite ship structures can be mitigated by characterizing the variability of composite material properties thus ensuring acceptable levels of safety. The objectives for work outlined in this report are as follows: 1) Identify apparent material variability resulting from ASTM test procedures; 2) Modify/recommend a series of coupon level test procedures that minimizes testing variability; 3) Develop a probabilistic finite element tool to predict material variability. Recommendations for material testing of marine grade woven roving fiberglass reinforced plastic materials have been presented.

DTIC

*Composite Materials; Composite Structures; Fiber Composites; Independent Variables; Panels; Reinforced Plastics; Reliability*

**20080001451** NASA Glenn Research Center, Cleveland, OH, USA

**Design and Optimization of Composite Gyroscope Momentum Wheel Rings**

Bednarczyk, Brett A.; Arnold, Steven M.; September 2007; 23 pp.; In English; 48th Structures, Structural Dynamics, and Materials (SDM) Conference, 23-26 Apr. 2007, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): NCC3-650; WBS 861726.01.03.0555.01

Report No.(s): NASA/TM-2007-214967; AIAA Paper-2007-2293; E-16120; Copyright; Avail.: CASI: [A03](#), Hardcopy

Stress analysis and preliminary design/optimization procedures are presented for gyroscope momentum wheel rings composed of metallic, metal matrix composite, and polymer matrix composite materials. The design of these components involves simultaneously minimizing both true part volume and mass, while maximizing angular momentum. The stress analysis results are combined with an anisotropic failure criterion to formulate a new sizing procedure that provides considerable insight into the design of gyroscope momentum wheel ring components. Results compare the performance of two optimized metallic designs, an optimized SiC/Ti composite design, and an optimized graphite/epoxy composite design. The graphite/epoxy design appears to be far superior to the competitors considered unless a much greater premium is placed on volume efficiency compared to mass efficiency.

Author

*Gyroscopes; Angular Momentum; Stress Analysis; Failure; Graphite-Epoxy Composites; Design Analysis; Design Optimization*

**20080001453** NASA Glenn Research Center, Cleveland, OH, USA

**Reliability and Creep/Fatigue Analysis of a CMC Component**

Murthy, Pappu L. N.; Mital, Subodh K.; Gyekenyesi, John Z.; Gyekenyesi, John P.; September 2007; 20 pp.; In English; ASME Turbo Expo 2007, Power for Land, Sea and Air Conference, 14-17 May 2007, Montreal, Canada; Original contains color illustrations

Contract(s)/Grant(s): WBS 599489.02.07.03.02.02.02

Report No.(s): NASA/TM-2007-214975; E-16136; Copyright; Avail.: CASI: [A03](#), Hardcopy

High temperature ceramic matrix composites (CMC) are being explored as viable candidate materials for hot section gas turbine components. These advanced composites can potentially lead to reduced weight and enable higher operating temperatures requiring less cooling; thus leading to increased engine efficiencies. There is a need for convenient design tools that can accommodate various loading conditions and material data with their associated uncertainties to estimate the minimum predicted life as well as the failure probabilities of a structural component. This paper presents a review of the life prediction and probabilistic analyses performed for a CMC turbine stator vane. A computer code, NASALife, is used to predict the life of a 2-D woven silicon carbide fiber reinforced silicon carbide matrix (SiC/SiC) turbine stator vane due to a mission cycle which induces low cycle fatigue and creep. The output from this program includes damage from creep loading, damage due to cyclic loading and the combined damage due to the given loading cycle. Results indicate that the trends predicted by NASALife are as expected for the loading conditions used for this study. In addition, a combination of woven composite micromechanics, finite element structural analysis and Fast Probability Integration (FPI) techniques has been used to evaluate the maximum stress and its probabilistic distribution in a CMC turbine stator vane. Input variables causing scatter are identified and ranked based upon their sensitivity magnitude. Results indicate that reducing the scatter in proportional limit strength of the vane material has the greatest effect in improving the overall reliability of the CMC vane.

Author

*Life (Durability); Creep Properties; Vanes; Probability Theory; Proportional Limit; Ceramic Matrix Composites; Gas Turbine Engines*

**20080001460** NASA Langley Research Center, Hampton, VA, USA

**Local Elastic Constants for Epoxy-Nanotube Composites from Molecular Dynamics Simulation**

Frankland, S. J. V.; Gates, T. S.; November 26, 2007; 7 pp.; In English; 2007 Materials Research Society (MRS) Fall Meeting, 26-30 Nov. 2007, Boston, MA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 732759.07.09; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001460>

A method from molecular dynamics simulation is developed for determining local elastic constants of an epoxy/nanotube composite. The local values of C11, C33, K12, and K13 elastic constants are calculated for an epoxy/nanotube composite as a function of radial distance from the nanotube. While the results possess a significant amount of statistical uncertainty resulting from both the numerical analysis and the molecular fluctuations during the simulation, the following observations can be made. If the size of the region around the nanotube is increased from shells of 1 to 6 in thickness, then the scatter in

the data reduces enough to observe trends. All the elastic constants determined are at a minimum 20 from the center of the nanotube. The C11, C33, and K12 follow similar trends as a function of radial distance from the nanotube. The K13 decreases greater distances from the nanotube and becomes negative which may be a symptom of the statistical averaging.

Author

*Elastic Properties; Molecular Dynamics; Nanotubes; Simulation; Mathematical Models; Epoxy Matrix Composites*

**20080001624** Monash Univ., Victoria, Australia

**Thermographic Tools for Quality Control and Damage Assessment of Z-Pinned Composite Space Structures**

Jones, Rhys; Nov 2005; 85 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0614

Report No.(s): AD-A473073; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473073>

It would appear that lockin thermography could 'just' assess the presence and distribution of the z pins in the composite structures. It was also possible to detect thickness variations specimens that were approximately 12 mm thick.

DTIC

*Composite Structures; Damage Assessment; Large Space Structures; Quality Control; Spacecraft Structures; Thermography*

**20080001650** Banaras Hindu Univ., Varanasi, India

**Effect of Aggressive Environments on Mechanical Performance of Fibre Ceramic Composites**

Srivastava, Vijay K; Jul 2007; 37 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0046

Report No.(s): AD-A473112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473112>

Based on the experimental observation, the results clearly indicate that weight of C/C-SiC composite is damaged severally at about 2% and 2D C/C composite damaged nearly 12% when oxidised in open atmosphere by the flame of oxy-acetylene gas. The changes in microhardness, XRD pattern and thermal properties are appeared because of delamination, debonding, pyrolysis of matrix and formation of CO, CO<sub>2</sub> and SiO<sub>2</sub>. Therefore, maximum tensile and compressive stress of ceramic composites decreased with the oxidation time in open atmosphere by oxyacetylene gas flame. Also, SiC ceramic coating on 4D carbon composites resulted that the carbon-carbon composite temperature predicts the oxidation kinetic is severe after 1273K. This was due to formation of smooth silicon carbide film phases covering the surface of the composite. Which is less volatile and showed lower oxygen permeability, and consequently acted as an effective oxygen diffusion barrier? The whole study shows that a combination of both silicon and carbon based materials system is more useful for elevated oxidation protection of carbon-carbon composites.

DTIC

*Carbon-Carbon Composites; Ceramic Matrix Composites; Fibers; Mechanical Properties; Oxidation*

**20080002123** Naval Postgraduate School, Monterey, CA USA

**The Enhancement of Composite Scarf Joint Interface Strength Through Carbon Nanotube Reinforcement**

Slaff, Randolph E; Jun 2007; 106 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473432; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this research is to investigate the potentially significant improvement to scarf joint bonding achieved through the dispersion of carbon nanotubes along the interface of the composite joint. The study examines various factors that may affect carbon nanotube reinforced joint interface strength. Each composite joint consists of a vinyl-ester matrix base, DERAKANE 510-A, interlaced with a carbon fiber weave, TORAY T700CF. During the curing process the research explores several variables concerning the carbon nanotube application. The testing includes single walled carbon nanotubes (SWCNT) and multi-walled carbon nanotubes (MWCNT) with varying length, purity, and concentration levels along the surface area of the joint interface. This wide array of data demonstrates the effect of carbon nanotubes introduction at the joint interface and provides the ideal type, size, purity level, and concentration level for composite scarf joint bond reinforcement using carbon nanotubes.

DTIC

*Augmentation; Bonded Joints; Carbon Nanotubes; Scarf Joints*

**20080002374** Maine Univ., Orono, ME USA

**Effect of Processing Parameters on Reliability of VARTM/SCRIMP Composites Panels, Phase 1**

El-Chiti, Fadi; Aug 2005; 267 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N0014-03-1-0542

Report No.(s): AD-A473542; 08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473542>

It was found that there is significant variability in physical and mechanical properties of marine composites among different manufacturers resulting in inconsistent parameters for structural analysis and design. Experimental variability can be classified in two main groups: 1) variability from experimental preparation and testing techniques and 2) variability from the material constituents and manufacturing process. The objective of the thesis is to resolve the uncertainty surrounding mechanical properties obtained from conventional standard testing by optimizing the testing procedure used in obtaining the material properties of marine FRP composites. A series of ASTM standard test procedures for each material property (tensile, compressive, and shear) are conducted using a 3D digital image correlation system for measuring full-field strains. Glass transition temperature, fiber volume fraction, and density will be measured using ASTM standard tests. The study will lead to drafting material testing specifications to be used in obtaining reliable mechanical and physical properties for FRP composites used in structural applications. Finally, the testing program will be accompanied with a micromechanics analysis that will be used to characterize the FRP properties using an array of techniques. The micromechanics analysis will be used to explain the results of the material coupon tests and characterize the variability in the tests.

DTIC

*Composite Materials; Esters; Glass Fiber Reinforced Plastics; Glass Transition Temperature; Panels; Plastics; Reliability*

**20080002888** NASA Langley Research Center, Hampton, VA, USA; National Inst. of Aerospace, Hampton, VA, USA

**Characterizing SWCNT Dispersion in Polymer Composites**

Lillehei, Peter T.; Kim, Jae-Woo; Gibbons, Luke; Park, Cheol; November 26, 2007; 1 pp.; In English; 2007 Materials Research Society (MRS) Fall Meeting, 26-30 Nov. 2007, Boston, MA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NCC-1-02037; Copyright; Avail.: CASI: [A01](#), Hardcopy

The new wave of single wall carbon nanotube (SWCNT) infused composites will yield structurally sound multifunctional nanomaterials. The SWCNT network requires thorough dispersion within the polymer matrix in order to maximize the benefits of the nanomaterial. However, before any nanomaterials can be used in aerospace applications a means of quality assurance and quality control must be certified. Quality control certification requires a means of quantification, however, the measurement protocol mandates a method of seeing the dispersion first. We describe here the new tools that we have developed and implemented to first be able to see carbon nanotubes in polymers and second to measure or quantify the dispersion of the nanotubes.

Author

*Carbon Nanotubes; Characterization; Nanoparticles; Polymer Matrix Composites*

**20080012237** California Inst. of Tech., Pasadena, CA USA

**Ion-exchange hollow fibers**

Rembaum, Alan, Inventor; Yen, Shiao-Ping S., Inventor; Klein, Elias, Inventor; August 30, 1977; 10 pp.; In English

Patent Info.: Filed February 24, 1975; US-PATENT-4,045,352; US-PATENT-APPL-SN-552158; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012237>

An ion-exchange hollow fiber is prepared by introducing into the wall of the fiber polymerizable liquid monomers, and polymerizing the monomers therein to form solid, insoluble, cross-linked, ion-exchange resin particles which embed in the wall of the fiber. Excess particles blocking the central passage or bore of the fiber are removed by forcing liquid through the fiber. The fibers have high ion-exchange capacity, a practical wall permeability and good mechanical strength even with very thin wall dimensions. Experimental investigation of bundles of ion-exchange hollow fibers attached to a header assembly have shown the fiber to be very efficient in removing counterions from solution.

Official Gazette of the U.S. Patent and Trademark Office

*Crosslinking; Monomers; Solubility; Walls*

**20080012285** BASF Structural Materials, Inc., Charlotte, NC USA

**Process for preparing tows from composite fiber blends**

McMahon, Paul, Inventor; Chung, Tai-Shung, Inventor; Ying, Lincoln, Inventor; October 17, 1989; 13 pp.; In English  
Contract(s)/Grant(s): NAS1-15749

Patent Info.: Filed December 5, 1986; US-PATENT-4,874,563; US-PATENT-APPL-SN-940234; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012285>

A continuous, substantially uniform tow useful in forming composite molded articles is prepared by forming a continuous tow of continuous carbon fibers, forming a continuous tow of thermoplastic polymer fibers to a selected width, uniformly and continuously spreading the carbon fiber tow to a width that is essentially the same as the selected width for the thermoplastic polymer fiber tow, intermixing the tows intimately, uniformly and continuously, in a relatively tension-free state, and continuously withdrawing the intermixed tow.

Official Gazette of the U.S. Patent and Trademark Office

*Carbon Fibers; Thermoplasticity*

**20080012288**

**Process for coating an object with silicon carbide**

Levin, Harry, Inventor; October 3, 1989; 12 pp.; In English

Contract(s)/Grant(s): NAS7-100

Patent Info.: Filed August 8, 1988; US-PATENT-4,871,587; US-PATENT-APPL-SN-230740; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012288>

A process for coating a carbon or graphite object with silicon carbide by contacting it with silicon liquid and vapor over various lengths of contact time. In the process, a stream of silicon-containing precursor material in gaseous phase below the decomposition temperature of said gas and a co-reactant, carrier or diluent gas such as hydrogen is passed through a hole within a high emissivity, thin, insulating septum into a reaction chamber above the melting point of silicon. The thin septum has one face below the decomposition temperature of the gas and an opposite face exposed to the reaction chamber. The precursor gas is decomposed directly to silicon in the reaction chamber. A stream of any decomposition gas and any unreacted precursor gas from said reaction chamber is removed. The object within the reaction chamber is then contacted with silicon, and recovered after it has been coated with silicon carbide.

Official Gazette of the U.S. Patent and Trademark Office

*Coating; Silicon Carbides*

**20080012289** BASF Structural Materials, Inc., Charlotte, NC USA

**Process for preparing composite articles from composite fiber blends**

McMahon, Paul E., Inventor; Chung, Tai-Shung, Inventor; Ying, Lincoln, Inventor; October 3, 1989; 13 pp.; In English

Contract(s)/Grant(s): NAS1-15749

Patent Info.: Filed January 6, 1987; US-PATENT-4,871,491; US-PATENT-APPL-SN-004219; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012289>

A composite article is prepared by forming a continuous tow of continuous carbon fibers, forming a continuous tow of thermoplastic polymer fibers, uniformly and continuously spreading the thermoplastic polymer fibers to a selected width, uniformly and continuously spreading the carbon fiber tow to a width that is essentially the same as the selected width for the thermoplastic polymer fiber tow, intermixing the tows intimately, uniformly and continuously, in a relatively tension-free state, continuously withdrawing the intermixed tow and applying the tow to a mold and heating the tow.

Official Gazette of the U.S. Patent and Trademark Office

*Carbon Fibers; Fiber Composites; Thermoplasticity*



**INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY**

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category 34 *Fluid Dynamics and Thermodynamics*. For astrochemistry see category 90 *Astrophysics*.

**2008000362** World Technology Evaluation Center, Baltimore, MD USA

**International Assessment of Carbon Nanotube Manufacturing and Applications**

Eklund, Peter; Ajayan, Pulickel; Blackmon, Robert; Hart, A J; Kong, Jing; Pradhan, Bhabendra; Rao, Apparao; Rinzler, Andrew; Jun 2007; 140 pp.; In English

Contract(s)/Grant(s): ENG-0423742

Report No.(s): AD-A472146; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472146>

This WTEC study focuses on the manufacturing and applications of carbon nanotubes 'CNTs' to identify recent progress in understanding the commercial potential of CNTs as viewed by academic, industrial, and government research facilities around the world. CNT manufacturing methods and equipment, processing and separation techniques, characterization procedures, and opportunities for international collaboration are highlighted in this study. These issues are also discussed in the context of leading electronic, optical, and mechanical applications of CNTs ranging from transistors to structural composites. CNTs can be produced by many methods, and depending on the diameter, one can obtain either single-walled CNTs 'SWCNTs' or multi-walled CNTs 'MWCNTs'. The current capacity for the production of MWCNTs far exceeds that of SWCNTs. SWCNTs are much more expensive and difficult to manufacture than MWCNTs, and there is not yet a distinct large-scale market for SWCNTs, which is needed to drive down the production cost. For both types of CNTs, Asia's production capacity is two to three times higher than that estimated for North America and Europe combined; Japan is the prominent leader in the production of MWCNTs. Use of CNTs in lithium-ion battery electrodes is the current driving force of ton-scale MWCNT production in Japan. CNT-replacement products for indium tin oxide 'ITO' and field emission devices 'FEDs' are driving increased production of SWCNTs, whereas applications using transistors require precise control over CNT diameter and conductivity, which is farther from commercial realization. When the cost of bulk SWCNTs decreases significantly, applications in electromagnetic shielding 'EMI' and electrostatic discharge 'ESD' protection can be expected, and SWCNTs will replace MWCNTs in conductive plastics.

DTIC

*Carbon Nanotubes; Manufacturing*

**2008000421** Southwest Research Inst., San Antonio, TX USA

**Investigation of 'Apple Jelly' Contaminant in Military Jet Fuel**

Waynick, J A; Westbrook, Steven R; Dipoma, Larry; Mar 2002; 210 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): SP060099D5944

Report No.(s): AD-A472258; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472258>

Between 1980 and 1985, a representative of Imperial Oil made a presentation to Subcommittee J (aviation fuels) of ASTM Committee D2 concerning a contaminant found in the Alberta Products Pipeline (APPL). The contaminant had a high viscosity and was eventually called 'APPL' jelly. It is not clear whether the name eventually evolved into apple jelly or someone coined the name separately because of the appearance of the contaminant. However, since that time, the name has been applied to a range of contaminants found in aviation fuel delivery systems (primarily U.S. Air Force). The objective of this project was to characterize this aviation fuel contaminant known with respect to the compositional and process conditions required for its formation, and to determine possible methods, both compositional and process, whereby its formation can be reduced or prevented. This work has demonstrated that apple jelly is a complex mixture. It begins with water and DiEGME (diethylene glycol monomethyl ether). This mixture reacts with its environment, extracting and dissolving compounds from the materials with which it comes in contact. In this work we started with apple jelly samples collected throughout the DoD/Air Force fuel-distribution system. The majority of our samples came from fuel systems delivering JP-8 to aircraft. All the fuels contained corrosion inhibitor, FSII (fuel system icing inhibitor), and SDA (static dissipator additive) in varying amounts. Other than FSII, this work focused on only one JP-8 additive, SDA. The work presented in this report explains the majority of the properties of the various apple jelly samples we received. We were able to demonstrate how thin and thick apple jelly, of the types we analyzed, could form.

DTIC

*Contaminants; Fuel Contamination; Jet Engine Fuels*

**20080000541** HY-Tech Research Corp., Radford, VA USA

**Plasma-Arc Deposited Elemental Boron Film for use as a Durable Nonstick Coating**

Klepper, C C; Sep 2007; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD16-02-C-0024

Report No.(s): AD-A472260; HY-TECH-D0154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Report developed under Small Business Innovation Research Contract. Under this Phase I SBIR contract, HY-Tech Research performed development of an abrasion resistant, non-stick coating for cookware used by the U.S. Army in the field. The deposition technique uses a vacuum arc source of elemental boron, a high-temperature material with excellent hardness, lubricity and chemical inertness. HY-Tech's boron arc source is based on the vacuum (cathodic) arc process, which produces the coating material by very efficient evaporation of the solid cathode. The Phase I project demonstrated that it is possible to deposit adherent coatings of amorphous boron on aluminum alloy substrates, even at high deposition rates (>1 nm/s) and on surfaces that are not highly polished. The Phase I project successfully developed a deposition procedure for adhering boron to non-polished 3004Al samples, as cut from a commercial roaster pan by varying the substrate bias program as well as substrate preparation. Microscopy indicated good adhesion to the substrate; however, tests in a high-salt environment led to delamination, suggesting that chemical bonding is weak or non-existent, which is consistent with our predictions.

DTIC

*Boron; Coating; Durability; Plasmas (Physics); Protective Coatings*

**20080000546** General Accounting Office, Washington, DC USA

**Chemical Demilitarization: Actions Needed to Improve the Reliability of the Army's Cost Comparison Analysis for Treatment and Disposal Options for Newport VX Hydrolysate**

D'Agostino, Davi M; Jan 26, 2007; 29 pp.; In English

Report No.(s): AD-A472300; GAO-07-240R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. stockpile of 1,269 tons of VX nerve agent stored at the Newport Chemical Depot (Newport), Indiana, is one of nine stockpiles that the Department of Defense (DOD) must destroy in response to congressional direction initially provided in 1985. In addition, the stockpile must be destroyed to comply with the requirements of the Chemical Weapons Convention, which the USA became a party to in 1997. The stockpile at Newport is the first U.S. stockpile containing VX that will be destroyed by using neutralization a process that mixes hot water and sodium hydroxide (a caustic chemical) with VX to change the chemical composition to a less toxic form. The resulting by-product is a liquid wastewater commonly referred to as hydrolysate that consists mostly of water but also has a caustic component and organic salts that need further treatment to meet Chemical Weapons Convention requirements and to meet federal and state environmental requirements for disposal. The John Warner National Defense Authorization Act for Fiscal Year 20075 mandated that we review the Army's Cost-Benefit Analysis of Off-Site Versus On-Site Treatment and Disposal of Newport Caustic Hydrolysate. Specifically, we (1) assessed the reasonableness of the Army's rationale to eliminate five of the eight technologies for treating Newport's hydrolysate; (2) determined what other options the Army considered, such as incineration; and (3) evaluated the adequacy of the cost comparison analysis presented for the three remaining technologies considered as alternatives to the Army's proposed plan. To meet the December 1, 2006, due date, we briefed or offered to brief your offices prior to that time. This report provides details of our findings and our conclusions and recommendations. We will also issue a separate letter on our assessment of the Army's cost-benefit analysis once DOD has completed its sensitivity review of the data in that letter.

DTIC

*Cost Analysis; Cost Estimates; Reliability; Waste Treatment; Waste Water*

**20080000627** Southwest Missouri State Univ., Springfield, MO USA

**Polymer Based Highly Parallel Nanoscopic Sensors for Rapid Detection of Chemical and Biological Threats**

Giedd, Ryan; Curry, Matt; Han, Xuliang; Sep 18, 2007; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00173-05-C-6022; Proj-56-9112-05

Report No.(s): AD-A472473; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Raw carbon nanotubes (CNTs) contain a wide range of impurities from the growth process. At Brewer Science an effective post-growth purification procedure was developed to reduce the amount of impurities, and several characterization techniques were developed and validated.

DTIC

*Carbon Nanotubes; Detection; Purification*

**2008000930** National Cheng Kung Univ., Tainan, Taiwan, Province of China

**Evaluation of Environmental Effects on Mechanical Properties and Characterization of Creep Behavior of PMMA**

Chen, Kuo-Shen; Hsu, Rui-Fung; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 267-274; In English; See also [2008000927](#)

Contract(s)/Grant(s): NSC-89-2212-E-006-120; NSC-91-2218-E-006-016; Copyright; Avail.: Other Sources

Polymethylmethacrylate (PMMA) is an important polymer used for bio-compatible related applications, usually in environments with body fluids at a temperature higher than room temperature for an extremely long period of operation. Knowledge of mechanical properties of PMMA is therefore needed for successful device longevity design. In this paper, effect on Young's modulus, ultimate tensile strength, and a creep constitutive law of PMMA specimens over a broad range of temperatures between room temperature and 95 C has been presented. In addition, the influence of DI water and saline on the strength and stiffness has also been investigated. Specimens were designed as dog bone shapes and fabricated using an excimer laser micromachining system. The test data indicate that both the modulus and the tensile strength decrease with temperature rise and the presence of DI water or saline can change the microstructure of PMMA and cause a transition from brittle to ductile at room temperature. Finally, a set of 36 creep tests was performed to fit a power law creep model by obtaining the associated creep parameters and the model has been subsequently verified by additional experimental data. The data obtained in this work should be important for design improvements to prolong the stability of PMMA for related applications.

Author

*Creep Properties; Environment Effects; Mechanical Properties; Polymethyl Methacrylate; Microelectromechanical Systems; Bioinstrumentation*

**2008000979** National Tsing Hua Univ., Hsinchu, Taiwan, Province of China

**Dispersion and Reinforcement of Nanotubes in High Temperature Polymers for Ultrahigh Strength and Thermally Conductive Nanocomposites**

Yang, Arnold C; Oct 3, 2007; 73 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0440

Report No.(s): AD-A472590; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472590>

Fundamental approaches for controlled dispersion of multiwalled carbon nanotubes in polymers and the molecular reinforcement in their nanocomposites were studied to design and fabricate well-dispersed percolated carbon nanotube networks in high temperature polymers.

DTIC

*Carbon Nanotubes; Fabrication; High Temperature; Nanocomposites; Nanotubes*

**2008000980** Army Cold Regions Research and Engineering Lab., Hanover, NH USA

**Environmental Screening Assessment of Perchlorate Replacements**

Clausen, Jay L; Clough, Stephen; Gray, Michael; Gwinn, Patrick; Aug 2007; 53 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472594; ERDC/CRREL-TR-07-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472594>

A screening level assessment of the fate, transport, and toxicity of four potential replacements for perchlorate was performed. Resulting data will allow for evaluation and minimization of the potential environmental liability associated with the use of energetic compounds as propellants. This report details methods used and assessment findings. Inorganic oxidizer ammonium di(nitramido)amine (ADNA); cyclic nitramine/ gem-dinitro compound 1,3,5-tetranitrohexahydropyrimidine (DNNC); 1,3,3,5,7,7-hexanitro-1,5-diazacyclooctane (HCO); and diammonium di(nitramido)dinitroethylene (ADNDNE) were evaluated. Their respective analogue compounds also were evaluated: ammonium dinitramide (ADN); hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX); octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX); and 1,1-diamino-2,2-dinitroethene (FOX-7). Evaluations of ammonium perchlorate (AP) provide a point of comparison. From an environmental fate and transport perspective, it appears ADNA, ADNDNE, DNNC, and HCO may have some characteristics similar to AP. However, it is possible HCO and DNNC are much less soluble in water than AP, thereby reducing the likelihood of environmental transport. It also is anticipated that ADNA, ADNDNE, DNNC, and HCO will readily photodegrade. However, rates of degradation in subsurface soil, groundwater, deep surface water, and sediment appear highly variable and may be dependent on covariables not evaluated for this assessment. Because of uncertainty with the model predicted results, recommendations

for additional analysis, which could yield compound-specific data and reduce uncertainty, are provided.

DTIC

*Environmental Transport; Ground Water; Perchlorates; Soils; Toxicity*

**20080001003** Woods Hole Oceanographic Inst., MA USA

**Geochemistry of Slow-Growing Corals: Reconstructing Sea Surface Temperature, Salinity and the North Atlantic Oscillation**

Goodkin, Nathalie F; Jun 2007; 284 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): OCE-0402728

Report No.(s): AD-A472632; MIT/WHOI2007-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472632>

A 225-year old coral from the south-shore of Bermuda (64CW, 32CN) provides a record of decadal-to-centennial scale climate variability. The high accretion rates, longevity, and skeletal growth bands found in coral skeletons make them an ideal resource for well-dated, seasonal climate reconstructions. Coral skeletons incorporate strontium (Sr) and calcium (Ca) in relative proportions inversely to the sea surface temperature (SST) in which the skeleton is secreted.  $\Delta(\text{exp } 18)\text{O}$  of the coral skeleton changes based on both temperature and the  $8(\text{exp } 18)\text{O}$  of sea water ( $\Delta\text{Ow}$ ), and 80 is proportional to sea surface salinity (SSS). Sr/Ca was used to reconstruct winter-time and mean-annual SST, employing the first growth-corrected Sr/Ca-SST model. SSTs are 1.5C colder during the end of the Little Ice Age than today. SSS is fresher during that time. Winter-time SSTs at Bermuda are correlated to phases of the North Atlantic Oscillation (NAO). Using winter Sr/Ca as a proxy for temperature, we show strong coherence to the NAO at multi-decadal and inter-annual frequencies. These coral records show changes in variance in the NAO during the late 20th century, but limited changes in the mean phase of the NAO, implying that climate change may be pushing the NAO to extremes but not to a new mean position.

DTIC

*Atlantic Ocean; Climate; Geochemistry; Oscillations; Salinity; Sea Surface Temperature; Sea Water; Surface Temperature*

**20080001017** Army Research Lab., Aberdeen Proving Ground, MD USA

**Characterization of Particle Output From a Percussion Primer**

Chang, Lang-Mann; Williams, Anthony W; Aug 2007; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-622618.H8099

Report No.(s): AD-A472669; ARL-TR-4188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472669>

Measurements were made for the percentage of combustion products in condensed phases from a no. 41 percussion primer, and the influence of the condensed phases on the charge ignition in the 5.56-mm ammunition was characterized. The studies were carried out in three phases using three different test fixtures. Results showed 34% of the combustion products in condensed phases, including liquid and solid particles. With the residue remaining in the primer cup added together, the percentage increased to 44%. Subsequently, a channel was developed that was able to capture most of the particles exiting from the primer. Tests were then conducted for primer output flows, with and without particles present, interacting with propellant in a closed chamber. The pressure-time traces for the two flow conditions closely followed each other during the early period of time. At a later time, however, the pressure rise became much faster for the flow with particles present. A correlation of the pressure measurement to photographic evidence suggested that the condensed phases may have helped accelerate the charge ignition process and possibly reduced the ballistic cycle time but had no significant influence on the initiation of charge ignition at the ambient temperature of 21 oC. Further studies will be required to examine the results at cold temperature conditions.

DTIC

*Combustion; Ignition; Percussion; Pressure Measurement*

**20080001036** Army Research Lab., Aberdeen Proving Ground, MD USA

**Detection of Energetic Materials and Explosive Residues With Laser-Induced Breakdown Spectroscopy: 1. Laboratory Measurements**

Gottfried, Jennifer L; De Lucia, Jr , Frank C; Harmon, Russell S; Munson, Chase A; Winkel, Jr , Raymond J; Miziolek, Andrzej W; Sep 2007; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-622618H8049

Report No.(s): AD-A472707; ARL-TR-4240; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472707>

Laser-induced breakdown spectroscopy (LIBS) has been investigated for the detection of energetic materials. After an

initial survey of explosives and propellants, key elemental and molecular emission lines in the LIBS spectra were identified. Techniques for improving the sensitivity and selectivity of LIBS for explosives detection, such as the use of an argon buffer gas and double pulse LIBS, have been investigated with laboratory and field-portable instruments. We present results demonstrating the ability of LIBS to discriminate between energetic and non-energetic materials.

DTIC

*Explosives; Residues*

**20080001148** Pohang Univ. of Science and Technology, Pohang, Korea, Republic of  
**Low Temperature Synthesis of Carbon Nanotubes by Direct Microwave Irradiation**

Lee, Kun-Hong; Aug 9, 2007; 29 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0455

Report No.(s): AD-A472795; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The data suggest that microwave heating is a very efficient method to heat catalyst particles, decompose hydrocarbons, and finally synthesize CNTs. However, final conclusion will be made after completing the analysis of synthesized CNTs.

DTIC

*Carbon Nanotubes; Irradiation; Low Temperature; Microwaves; Nanostructure Growth*

**20080001149** National Tsing Hua Univ., Hsinchu, Taiwan, Province of China  
**Localized Surface Plasmon Resonance of Metal Nanodot Nanowire Arrays Studied by Far-Field and Near-Field Optical**

Lin, Heh-Nan; Sep 5, 2007; 8 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0072

Report No.(s): AD-A472797; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A combination of AFM nanomachining and lift-off process based on the one-layer approach is a convenient method for the fabrication of metal nanostructures. For an obtained Au nanodot array with an average diameter of 72 nm, the resonance peak in the LSPR scattering spectrum is located at 548 nm and consistent with simulated spectrum from Mie theory. For the Au nanowire arrays, the LSPR scattering spectra are composed of two resonance peaks in the red and the blue regions. The two peaks can be attributed to resonances along the width and the thickness directions. It is found that the red peak experiences a red shift when the width increases, whereas the blue peak experiences a blue shift when the thickness increases. However, both peaks experience a red shift when the aspect ratio of width to thickness increases. Furthermore, a linear behavior is observed in all the relationships. Additionally, a propagating length of around 10  $\mu$ m is observed for the SPPs at a wavelength of 532 nm in an Au stripe.

DTIC

*Far Fields; Metals; Nanowires; Near Fields; Optical Properties; Plasmons; Resonance Scattering; Surface Plasmon Resonance*

**20080001170** Soong Sil Univ., Seoul, Korea, Republic of  
**Synthesis of Hybrid Conducting Nanowire Using AAO Template**

Huh, Wansoo; Sep 28, 2006; 9 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0348; FA520905P0301

Report No.(s): AD-A472864; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The most promising way to prepare uniform dimension of nanomaterials is to use anodized alumina membrane as template. The work emphasized self-organized arrangement of pores in hexagonal array and vertical direction expansion for the high aspect ratio, and the self-limiting surface reaction. From these approaches, the atomic layer deposition was controlled precisely at the molecular level.

DTIC

*Aluminum Oxides; Anodizing; Atoms; Deposition; Membranes; Nanostructures (Devices); Nanowires; Templates*

**20080001186** California Univ., Berkeley, CA USA  
**Electro-Optic Materials Based Upon Inorganic Semiconductor Nanorod Liquid Crystals**

Alivisatos, A P; Dec 2006; 8 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0065

Report No.(s): AD-A472917; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this project we developed a new type of material system for use in opto-electronic applications. It consists of an array

of nanorods. The nanorods are quantum semiconductor structures with high fluorescence quantum yields, and with their bandgap emission energy controlled by the diameter of the rod. These quantum rods are coated with a monolayer of organic surfactant which renders them highly soluble in organic liquids. We demonstrated a method by which these nanorods can be deposited from solution in the presence of an electric field, such that the nanorods are oriented perpendicularly to the substrate.

DTIC

*Electro-Optics; Liquid Crystals; Luminescence; Nanorods; Nanostructures (Devices); Semiconductors (Materials)*

**20080001220** Air Force Research Lab., Edwards AFB, CA USA

**Differential Sputter Yields of Boron Nitride, Quartz, and Kapton Due to Low Energy Xe+ Bombardment (Preprint)**

Yalin, A P; Rubin, B; Domingue, S R; Glueckert, Z; Williams, J D; Jul 2007; 16 pp.; In English

Contract(s)/Grant(s): Proj-48470052

Report No.(s): AD-A472977; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this contribution we present results of differential sputter yield measurements of boron nitride, quartz, and kapton due to bombardment by xenon ions. The measurements are made using a sputtering diagnostic based on a quartz crystal microbalance (QCM). The QCM measurement allows full angular resolution, i.e. differential sputtering yield measurements are measured as a function of both polar angle and azimuthal angle. Measured profiles are presented for 100, 250, 350 and 500 eV Xe+ bombardment at 0-, 15-, 30° and 45° angles of incidence. We fit the measured profiles with Modified Zhang expressions using two free parameters: the total sputter yield, Y, and characteristic energy E\*. Total yields are calculated from the differential profiles and are compared with published values and weight loss values where possible.

DTIC

*Azimuth; Boron Nitrides; Kapton (Trademark); Polyimide Resins; Quartz; Sputtering; Xylene*

**20080001221** Air Force Research Lab., Edwards AFB, CA USA

**Species-Specific Sputtering Measurements with Cavity Ring-Down Spectroscopy (Preprint)**

Surla, V K; Tao, L; Yalin, A P; Jul 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-48470052

Report No.(s): AD-A472978; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report sputtering studies using cavity ring-down spectroscopy (CRDS). The high sensitivity of the technique and its non-intrusive nature make it amenable to both in situ device studies as well as basic characterization studies. We provide demonstrative measurements of sputtered particles showing the ability to determine species-specific number density and velocity. We summarize a spatial-scanning approach for differential sputter yield measurements and give a measurement example based on a tantalum target. We discuss the use of CRDS for measurement of multi-component materials and provide experimental results for detection of a Fe-Mn target as well as a proposed detection scheme for boron nitride.

DTIC

*Boron Nitrides; Cavities; Spectroscopy; Sputtering*

**20080001247** Air Force Research Lab., Edwards AFB, CA USA

**O+HCl Cross Sections and Reaction Probabilities in DSMC (Postprint)**

Ozawa, Takashi; Levin, D A; Wysong, I J; Jul 2006; 7 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0104; HQ0006-05-C-0021; Proj-2308

Report No.(s): AD-A473034; AFRL-PR-ED-TP-2006-212; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A chemical reaction model, suitable for use in the Direct Simulation Monte Carlo (DSMC) method, is developed to simulate hypervelocity collisions of an important reaction in atmospheric-jet interactions. The model utilizes the Quasi-Classical Trajectory (QCT) method with two potential energy surfaces (PES), new benchmark triple surfaces and London-Eyring-Polanyi-Sato (LEPS) PES. The sensitivity of the flow to the fidelity of the chemical model is investigated for the new QCT-derived model and the widely used Total Collision Energy (TCE) model of Bird. The adequacy of the total collision cross section is also considered, and to obtain accurate collision cross sections, the Dynamic Molecular Collision model of Tokumasu and Matsumoto is assumed and the collision cross section is obtained by using the MD/QCT method with the aforementioned potential energy surfaces. The magnitude of the inelastic cross section is small compared to the total cross section for both PESs. Therefore, MD/QCT VHS-equivalent collision cross sections are obtained and along with the MD/QCT reaction cross sections are utilized in the full DSMC calculation of the flow field. It is found that chemical reaction models

do not affect the general flowfield, however, the OH production rate is dependent on the chemical reaction model.

DTIC

*Chemical Reactions; Computerized Simulation; Hydrochloric Acid; Models; Monte Carlo Method; Probability Theory*

**20080001251** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

**GaN/AlGa<sub>N</sub> Terahertz Quantum Cascade Laser**

Wang, S C; Oct 7, 2005; 12 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0458; FA5209-04-T-0349

Report No.(s): AD-A473040; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The quantum-cascade laser (QCL) has, since its first realization, demonstrated an impressive and rapid development, extending the emission wavelengths from midinfrared to terahertz spectral range. However, QCLs based on GaAs/AlGaAs and AlInAs/GaInAs are not capable of emitting in the energy range around the LO-phonon energies (ELO~36 meV in GaAs and ELO~34 meV in InGaAs), leaving a gap in the spectral scale between 30 and 40  $\mu\text{m}$ . This can be overcome by using GaN/AlGa<sub>N</sub> material. The GaN based QCL has many advantages over the GaAs QCL. These include larger LO-phonon energy (ELO~90 meV), very fast carrier dynamics, far infrared emission wavelengths (> 40  $\mu\text{m}$ ), and room temperature operation capability. Therefore it has been considered the most desirable candidate for far infrared intersubband emission laser.

DTIC

*Aluminum Nitrides; Gallium Arsenides; Gallium Nitrides; Light Emitting Diodes; Quantum Cascade Lasers; Quantum Theory*

**20080001264** Georgia Inst. of Tech., Atlanta, GA USA

**Flex Biohybrid Nanomembranes as a Platform for Multifunctional Sensors**

Tsukruk, Vladimir V; Oct 10, 2007; 11 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0209; Proj-2312

Report No.(s): AD-A473058; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main focus of current activities was on synthesis of new branched and peptide-containing molecules and further development of sophisticated freely standing membranes with micropatterned structure. We synthesized several new amphiphilic hyperbranched molecules and silver-binding peptide for further incorporation into membrane film. Freely-standing arrays of carbon nanotubes and gold nanoparticles were fabricated as well and their properties tested with micromechanical studies and Raman spectroscopy. Specifically we studied: flexible nanomembranes with encapsulated silver nanowires and semiconducting quantum dots display outstanding micromechanical, fluorescence, and conducting properties; quantum dot nanomembranes suspended over optical cavities show exceptional backlight-enhanced fluorescence intensity; multifunctional hyperbranched molecules control monodisperse silver nanoparticle monolayer growth at the air-water interface. Silver-reducing peptides were encapsulated into ultrathin polymer film and formation of silver nanoparticles was demonstrated.

DTIC

*Fluorescence; Quantum Dots; Raman Spectroscopy*

**20080001265** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

**Localized Synthesis of Silicon Nanocrystals in Silicon-rich SiO<sub>2</sub> by CO<sub>2</sub> Laser Annealing**

Lin, Gong-Ru; May 1, 2007; 14 pp.; In English

Contract(s)/Grant(s): FA520905P0626

Report No.(s): AD-A473059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The optical properties of a SiO<sub>x</sub> film rapid-thermal-annealed 'RTA' by CO<sub>2</sub> laser are primarily investigated. The micro-photoluminescence 'PL' and HRTEM analysis indicate that the precipitation of random-oriented Si nanocrystals can be initiated when laser intensity 'Plaser' larger than 4.5 kW/cm<sup>2</sup>. At Plaser of 6 kW/cm<sup>2</sup>, the Si nanocrystals exhibits a largest diameter of 8 nm and a highest density of 4.5x10<sup>16</sup> cm<sup>-3</sup>, which emits strong PL at 790-825 nm. The micro-photorefectance of the CO<sub>2</sub> laser RTA SiO<sub>x</sub> film reveals a volume-density-product dependent refractive index increasing from 1.57 to 1.87 as the Plaser increases from 1.5 to 7.5 kW/cm<sup>2</sup>. Nonetheless, the laser ablation of SiO<sub>x</sub> film occurs with a linear ablation slope of 35 nm/kW/cm<sup>2</sup> at beyond 7.5 kW/cm<sup>2</sup>, which terminates the enlargement of Si nanocrystals, degrades the near-infrared PL, and slightly reduces the refractive index of the CO<sub>2</sub> laser RTA SiO<sub>x</sub> film.

DTIC

*Annealing; Carbon Dioxide Lasers; Laser Annealing; Nanocrystals; Photoluminescence; Silicon; Silicon Compounds; Silicon Dioxide*

**20080001267** Penn State Electro-Optics Center, Freeport, PA USA

**Multifunctional Oxide Films for Advanced Multifunction RF Systems**

Heydemann, Volker D; Sep 14, 2007; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-05-1-0238

Report No.(s): AD-A473061; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Electro-Optics Center of the Pennsylvania State University procured and established a custom-designed molecular beam epitaxy (MBE) system and commenced growth of oxide (TiO<sub>2</sub>, STO, BTO, BST and MgO) and III-nitride (AlN, GaN) thin films. The growth parameters and layer properties of these films were investigated by various in-situ and ex-situ characterization techniques under the aspect of developing a AlGaN HEMT epitaxy process, a BST varactor epitaxy process and aiding the integration of BST epitaxy on III-nitride templates using MgO buffer layers. Methods for the dielectric characterization of the epitaxial oxide films have been evaluated and applied in collaboration with Dr. Lanagan (Penn State Materials Research Laboratory).

DTIC

*Barium Titanates; Molecular Beam Epitaxy; Oxide Films; Radio Frequencies; Strontium Titanates; Thin Films*

**20080001272** Korean Inst. of Machinery and Materials, Changwon, Korea, Republic of

**AGD Surface Modification on Nanofibers to Improve Dispersion and Interfacial Bonding**

Kim, Byung-SUn; May 26, 2007; 21 pp.; In English

Contract(s)/Grant(s): FA5209-06-P-0187

Report No.(s): AD-A473067; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Vapor grown carbon fibers (VGCF) were plasma treated before added to PP 'propylene' and epoxy, respectively, in an attempt to improve the fiber's dispersion and interfacial bonding with the matrix. To disperse VGCF within PP, Hexamethyl-disiloxane was used to coat the fibers and to disperse VGCF within epoxy, the VGCF's were surface grafted with hydrophilic property that is most compatible with epoxy. For the case with PP, the dispersion of nanofibers was carried out by solution blending, mechanical mixing, and sonication. Levels of 4% - 31% volume content of VGCFs were mixed with polypropylene 'PP' powder, and then were melt-mixed using a twin-screw extruder in order to align the fibers. For the further alignment of fibers, extruded rods obtained by twin screw extruder were stacked in the mold cavity for the compression molding. In the case of 31% volume content, the tensile modulus and strength were improved by 100% and 40%, respectively, and the flexural modulus and strength were increased by 120% and 25%, respectively. The shear modulus showed 65% increase, but the strength dropped sharply by 40%. In the transverse direction, the tensile, flexural, and shear strength decreased as more fibers were added. The matrix modification by maleic anhydride (MAPP) increased the tensile and flexural properties of VGCF/PP by 20% - 30% in the longitudinal direction, and 40% - 250% increase in the transverse direction. The fiber surface treatment by plasma improved tensile and flexural properties of untreated VGCF/PP '18 % vol' composites by 10% - 30% in the longitudinal direction, but strength in the transverse direction decreased by 30% - 40%. For the case with epoxy, the dispersion of nanofibers was also carried out by solution blending, mechanical mixing, and sonication. Levels of 1 - 7wt% content of VGCFs were mixed within epoxy. The Atmospheric Plasma Treated 'APT VGCF's had much higher adhesive strength with epoxy matrix than ran VGCF's.

DTIC

*Bonding; Carbon Fibers*

**20080001499** Defence Research and Development Suffield, Suffield, Alberta Canada

**Development of Sampling Methods for Powders and Soil for Detection of Biothreat Agents by Electrochemiluminescence**

Thompson, H G; Fulton, R E; Ranches, J; Jun 2007; 32 pp.; In English; In English; Original contains color illustrations

Report No.(s): AD-A472876; DRDC-SUFFIELD-TM-2007-172; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The M1M (BioVeris Corporation), an automated electrochemiluminescent (ECL) assay instrument, has been shown to be a technology that is robust and tolerant of samples in a variety of complex matrices; however, methods for sampling of powders and soils in the field for processing on the M1M have not been described. This report describes the development of simple and reproducible methods that may be used for field sampling of powders and soils for subsequent screening and analysis on the M1M. By sampling with polyester swabs using a standard method, it was found that it was possible to collect a reproducible amount (~12 mg) of powder or soil from a variety of surfaces. Using this value, the volume of diluent required to produce a signal <1.2 on the M1M was empirically determined. The powder or soil suspension was filtered and the filtrate



assayed on the M1M. The result was a method that could be used consistently to assay powder and soil by ECL M1M with good sensitivity and minimal background signal.

DTIC

*Immunoassay; Powder (Particles); Sampling; Soils*

**20080001508** Defence Research and Development Suffield, Suffield, Alberta Canada

**Liquid Chromatography Electrospray Ionization Mass Spectrometric (LC-ESI-MS) and Desorption Electrospray Ionization Mass Spectrometric (DESI-MS) Identification of Chemical Warfare Agents in Consumer Products**

D'Agostino, P A; Chenier, C L; Jun 2007; 54 pp.; In English; In English

Report No.(s): AD-A472782; DRDC-SUFFIELD-TR-2007-074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Terrorist use of chemical warfare agents could involve contamination of consumer products with chemical warfare agents or other toxic chemicals. Liquid chromatography electrospray ionization mass spectrometry (LC-ESI-MS) and desorption electrospray ionization mass spectrometry (DESI-MS) have been used at DRDC Suffield for the identification of chemical warfare agents and both approaches were evaluated for the determination of chemical warfare agents in spiked consumer products. Three consumer products, bottled water, canola oil and corn meal, were selected as candidates for the evaluation and comparative purposes. Each of these media was contaminated with low mug/g levels of chemical warfare agents, levels typically used for evaluation purposes by the Organisation for the Prohibition of Chemical Weapons (OPCW). In house LC-ESI-MS and LC-ESI-MS/MS methods were evaluated for the determination of chemical warfare agents in spiked bottled water samples. The headspaces above spiked corn meal and canola oil samples were sampled with SPME fibers and the fibers were analysed by DESI-MS and DESI-MS/MS. MS data for all the spiked compounds were acquired in the continuum mode with a resolution of 8000, which typically resulted in mass measurement errors of 0.002 Da or less. Application of the developed sample handling and analysis methodologies is anticipated during forensic or other investigations where consumer products have been deliberately contaminated with chemical warfare agents.

DTIC

*Chemical Warfare; Consumers; Desorption; Ionization; Liquid Chromatography; Mass Spectroscopy*

**20080001623** Hannam Univ., Daejeon, Korea, Republic of

**Nanoscale Ordering of Functional Materials by Guided Self-Assembly for Photovoltaic Application: Synthesis and Characterizations**

Lee, Kwang-Sup; Mar 19, 2007; 15 pp.; In English

Contract(s)/Grant(s): FA52090-06-P-0054

Report No.(s): AD-A473071; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473071>

The work focused on (1) design, synthesis and characterization of nanoscale-ordered carbon nanotubes and C60 with high photoconductivity, and (2) study of potential implementation the resulting materials to photovoltaic applications.

DTIC

*Carbon Nanotubes; Nanotechnology; Nonlinear Optics; Polymers; Self Assembly*

**20080001625** University of South Australia, Mawson Lakes, Australia

**Reactions Between Contaminants and Functionalized Organic Self-Assembled Monolayers in Aqueous Solutions**

Majewski, Peter; May 16, 2006; 25 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0402

Report No.(s): AD-A473074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473074>

The interaction of bacteria, virus, and proteins with functionalized surfaces has been studied widely and the results of this investigation do not contradict the existing knowledge. However, the attachment of the organic matter onto self-assembled monolayers 'SAMs' coated particles in considerable agitated water is remarkable, because it indicates a strong interaction between the SAMs and the organic matter. At the pH of the water samples the organic compounds studied here are negatively charged, whereas, the NH<sub>2</sub>-terminated SAM is positively charged. It is therefore assumed, that the removal of the organic matter is mainly due to a strong electrostatic attraction and immobilisation of the organic matter at the surface of the particles. A very clear indication of the crucial role of the SAM is the fact that particles without SAM-coating 'NO-SAM' have no influence on the organic matter as indicated by the experiments. Increasing the available surface by decreasing the grain size

of the SAMs coated material significantly increases the efficiency of the removal. With SAMs coated silica powder a decrease of about two orders of magnitude of the amount of bacteria was observed after a treatment of 20 min, whereas, using coarser quartz sand a decrease of only about one order of magnitude was achieved.

DTIC

*Aqueous Solutions; Contaminants*

**20080001629** Korea Inst. of Tech., Seoul, Korea, Republic of  
**Growth and Characterization of Low Density InAs/GaAs Quantum Dots for Quantum Information Processes**

Choi, Won J; May 12, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA5209-06-P-0183

Report No.(s): AD-A473084; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473084>

The work demonstrated growth of low density QDs and optimized of growth parameters for low density In‘Ga‘As/GaAs QDs with enhanced molecular beam epitaxy ‘MEMBE’. The work also included characterization of wetting layer in low density QDs with a macro-PL measurement and development of PL measurement for a single QD spectroscopy at low temperature ~ 4 K.

DTIC

*Gallium Arsenides; Indium Arsenides; Molecular Beam Epitaxy; Quantum Dots; Quantum Theory*

**20080001631** Pennsylvania Univ., Philadelphia, PA USA  
**New Tools for the Study of Combustion Chemistry and Complex Gas-Surface Interactions from First Principles**

Rappe, Andrew M; Oct 6, 2007; 15 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0077

Report No.(s): AD-A473091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473091>

Molecular and radical chemisorption on ferroelectric oxides and on metals (Rh, Cu, Pt, Al, Pd, Ag) was studied with first-principles density functional theory (DFT). New methods were developed for computing the chemisorption energies of molecules to surfaces accurately within DFT. Oxide-supported metals were modeled as well, examining how oxide-metal bonding affects metal surface chemistry. Quantum Monte Carlo (QMC) calculations were performed on diatomic and polyatomic molecules, establishing the capability of computing atomic forces in molecules with QMC. Intermolecular interactions resulting from high molecular coverage were analyzed to understand saturation coverage. A direct dynamics approach was developed for computing the infrared emission signatures of combustion products, including vibrationally excited radicals and closed-shell molecules. The emission spectrum of vinyl radical C<sub>2</sub>H<sub>3</sub> was computed and compared with recent experiments. It was demonstrated that molecular radicals stabilize ferroelectric polarization in BaTiO<sub>3</sub> nanowires and PbTiO(sub-3) thin films. It was found that metal monolayers are significantly influenced by ferroelectric oxide supports, opening the possibility of ‘switchable nanocatalysts.’

DTIC

*Combustion; Combustion Chemistry; Gas-Solid Interactions; Software Development Tools; Surface Reactions*

**20080001637** Kyushu Univ., Fukuoka, Japan  
**Development of Odor Sensor to Recognize Partial Structures of Chemical Substances**

Toko, Kiyoshi; Feb 25, 2007; 8 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0240

Report No.(s): AD-A473097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473097>

The aim of this research is to develop an odor sensor information system that can resolve molecular information into the information of partial structures, the so-called artificial olfactory epithelium. Furthermore an attempt was made to quantify odor using molecular information.

DTIC

*Detectors; Epithelium; Molecules; Odors*

**20080001642** National Tsing Hua Univ., Hsinchu, Taiwan, Province of China  
**Novel Epitaxy Between Oxides and Semiconductors - Growth and Interfacial Structures**

Hong, Minghwei; May 16, 2007; 33 pp.; In English

Contract(s)/Grant(s): FA5209-06-P-0093

Report No.(s): AD-A473102; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473102>

The cubic gamma-Al<sub>2</sub>O<sub>3</sub> and Si have significantly different atomic structures and lattice constants. The lattice constant of gamma-Al<sub>2</sub>O<sub>3</sub> is 7.91 Å and that of Si is 5.42 Å. Matching the two lattices over a unit cell dimension will result in a greater than 30% lattice mismatch. It is intriguing that a highly ordered epitaxial growth was obtained in an unusually large mismatch for a hetero-epitaxial system. High-quality single-crystal Sc<sub>2</sub>O<sub>3</sub> films a few nanometer thick have been grown epitaxially on Si (111) despite a huge lattice mismatch. The films have the cubic bixbyite phase with a remarkably uniform thickness and high structural perfection. The bulk lattice constants of Si (5.43 Å) and Sc<sub>2</sub>O<sub>3</sub> (9.86 Å) are mismatched by 9.2 % (relative to the doubled Si unit cell dimension). It is intriguing that a highly ordered epitaxial growth was obtained with this unusually large mismatch. It is demonstrated that epitaxial GaN layers are grown on substrates of c-plane sapphire or Si (111) wafers with gamma-Al<sub>2</sub>O<sub>3</sub> or Sc<sub>2</sub>O<sub>3</sub> buffer layers. Even though the of line widths of GaN grown on c-plane sapphire is smaller, the crystalline quality of the GaN grown on Si(111) with buffer layers are observed to be impressively good.

DTIC

*Crystal Lattices; Epitaxy; Gallium Nitrides; Nanotechnology; Oxides; Semiconductors (Materials); Silicon*

**20080001645** Air Force Research Lab., Hanscom AFB, MA USA  
**Hydrothermal Synthesis and Growth of Ti:Sapphire(Ti<sup>3+</sup>:Al<sub>2</sub>O<sub>3</sub>) Laser Crystals**

Bliss, David; Callahan, Michael; Wang, Buguo; Oct 1, 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4916

Report No.(s): AD-A473105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473105>

Titanium-doped sapphire (Ti<sup>3+</sup>:Al<sub>2</sub>O<sub>3</sub>) crystals for high-power tunable lasers are presently in commercial production by growth from the melt. However, it is difficult to grow homogeneous crystals from the melt with uniform doping concentration because of the impurity segregation effect and more importantly, trivalent titanium instability. Hydrothermal synthesis has several advantages over traditional melt techniques. Here we report the growth of Ti<sup>3+</sup>:Al<sub>2</sub>O<sub>3</sub> crystals by the hydrothermal technique for the first time (Although hydrothermal growth of ruby crystals was reported before, there is no report on hydrothermal growth of Ti-sapphire crystals to date). The experimental conditions for the hydrothermal synthesis of titanium doped sapphire (Ti<sup>3+</sup>:Al<sub>2</sub>O<sub>3</sub>) crystals are reported. Characterization of the grown crystals by EPR, optical microscopy and elemental analysis are also presented. The hydrothermal technique has demonstrated the potential to grow high quality; compositionally uniform and pure trivalent Ti (III) doped sapphire single crystals for laser applications.

DTIC

*Additives; Crystal Growth; Crystals; Laser Applications; Lasers; Sapphire; Solid State Lasers; Titanium*

**20080001651** National Univ. of Singapore, Singapore  
**Studies into sub 100 nm Resists for Proton Beam Writing**

Kan, Jeroen A van; Bettioli, Andrew A; Osipowicz, Thomas; Watt, Frank; Jul 5, 2007; 7 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0031

Report No.(s): AD-A473114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473114>

Project AOARD 06-4004 has resulted in 5 scientific publications in the areas of resist investigation for proton beam writing, optimized proton beam focusing through new methods of detecting secondary electrons, and theoretical calculations that show the absence of proximity effects in proton beam writing. The project's Main achievement is a paper in 'Nano Letters' in which HSQ is introduced as a superior resist for proton beam writing down to the 20 nm level. In 2006-2007, the authors also have published three papers related to their AOARD 05-4037 project: one focused on the fabrication of microlenses, a second one on the optimized fabrication of resolution standards for proton beam writing, and a third paper that discusses the use of proton beam writing for the fabrication of metal stencil masks for LIGA X-ray fabrication.

DTIC

*High Resolution; Hydrogen; Nanotechnology; Optimization; Proton Beams; Sensitivity*

**20080001668** Korean Atomic Energy Research Inst., Taejon, Korea, Republic of  
**Consolidation of Al<sub>2</sub>O<sub>3</sub> Nano-Powder by Magnetic Pulsed Compaction and Sintering**

Kim, Whung W; Oct 16, 2007; 13 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0407

Report No.(s): AD-A473143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473143>

Successful ultra-fine nano Al<sub>2</sub>O<sub>3</sub> powder was consolidated and sintered using magnetic pulsed compaction. Measurements indicated that many properties in the consolidated Al<sub>2</sub>O<sub>3</sub> bulk have been much improved over the conventional polycrystalline materials. The optimization of the compaction parameters and sintering conditions will lead to the consolidation of Al<sub>2</sub>O<sub>3</sub> nanopowder for the higher density and even further enhanced mechanical properties.

DTIC

*Aluminum Oxides; Ceramics; Compacting; Compressors; Consolidation; Magnetic Fields; Sintering*

**20080001676** National Taiwan Univ., Taipei, Taiwan, Province of China

**InGa<sub>N</sub>/Ga<sub>N</sub> Quantum Dots --- Growth, Nano-Structure Material Analysis, and Optical Characterization**

Yang, Chih-Chung; Apr 27, 2005; 43 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0307

Report No.(s): AD-A473155; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473155>

We compare the result of strain state analysis (SSA) and photoluminescence (PL) of six InGa<sub>N</sub>/Ga<sub>N</sub> quantum well samples with un-doped, well-doped, and barrier-doped structures. Based on SSA images, a strain relaxation model is proposed for describing the nanostructure differences between the three sets of sample of different doping conditions. In the barrier-doped samples, the hetero-structure-induced. Therefore, strongly clustering nanostructures (quantum dots) are observed. In the well-doped samples, strain are partially relaxed and the spinodal decompositions are observed. Then, in the Un-doped samples, the un-relaxed strains result in higher miscibility between In<sub>N</sub> and Ga<sub>N</sub>, Leading to the relatively more uniform composition distributions. Between the Low- and high-indium samples, higher indium content leads to a stronger clustering behavior. The strain relaxations in the well-doped and barrier-doped samples result in their unclear S-Shape behaviors of PL spectral peaks. The enhanced carrier localization and reduced quantum-confined stark effect in the barrier-doped samples are responsible for their significant increases of radiative efficiency.

DTIC

*Characterization; Decomposition; Nanostructure (Characteristics); Nanostructures (Devices); Nanotechnology; Photoluminescence; Photonics; Quantum Dots; Stark Effect*

**20080001679** Environmental Science and Engineering, Inc., Gainesville, FL USA

**Environmental Survey and Assessment of Gateway Army Ammunition Plant**

Keirn, M A; Mousa, J J; Stratton, C L; Brown, J K; Jun 1982; 166 pp.; In English

Contract(s)/Grant(s): DAAG29-81-D-0100-0137

Report No.(s): AD-A473160; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473160>

An environmental survey and assessment of Gateway Army Ammunition Plant (GAAP) showed that the installation will require decontamination prior to release. Leaking PCB transformers and leaking, potentially PCB- contaminated hydraulic metal-forming equipment, in the process of being removed from GAAP prior to release of the property, have contaminated the sumps, process sewers, and basements of the Main Manufacturing Building. This material must be prevented from entering the River Des Peres storm channel or the solid waste system of St. Louis, Missouri. Other contaminants of GAAP which must be removed prior to release include spilled oil; peeling paint with excessive lead content; friable asbestos insulation; oil and sludge which are likely to be toxic under the definition of the Resources Conservation and Recovery Act of 1976; and a biological health hazard, which can cause histoplasmosis.

DTIC

*Ammunition; Contamination; Environmental Surveys; Hazards; Health*

**20080001691** Federal Aviation Administration, Oklahoma City, OK USA

**Intensity of the Internal Standard Response as the Basis for Reporting a Test Specimen as Negative or Inconclusive**  
Lui, Ray H; Wu, Chih-Hung; Chen, Yi-Jun; Chang, Chiung-Dan; Linville, Jason G; Canfield, Dennis V; Aug 2007; 14 pp.; In English

Report No.(s): AD-A473200; DOT/FAA/AM-07/23; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473200>

Under normal circumstances, a test specimen is reported as 'negative' when the response of the analyte is absent. However, if the intensity of the internal standard (IS) is low, indicating interference factors, the test could be considered 'inconclusive.' A quantitative hypothesis,  $A = (R \times I \times S) / L$ , serves as the 'cutoff' for the acceptable signal-to-noise (S/N) ratio for the IS in making 'negative/inconclusive' decisions, where A: acceptable S/N ratio for internal standard; R: relative response of the IS and the analyte (same concentration); I: concentration of the IS; S: (minimal S/N ratio); and L: limit of detection. The hypothesis was empirically tested using 9-carboxy-11-nor-delta9-tetrahydrocannabinol (THC-COOH) analyte, THC-COOH-d3 IS, and ibuprofen and hydrogen peroxide (H2O2) as interference factors. Urine specimens containing 0-5 ng/mL of THC-COOH were spiked with various quantities of ibuprofen or H2O2, followed by liquid-liquid extraction, derivatization, and GC-MS analysis under selected-ion-monitoring mode. Among the 'adulterated' test specimens evaluated, those with a S/N for the internal standard below the acceptable IS S/N 'A,' the quantitative criterion was indeed found to provide a useful guide for making negative/inconclusive decisions. This equation could be programmed into the instrument software to flag results as being negative/inconclusive when they do not meet the criteria described in this paper.

DTIC

*Drugs; Quantitative Analysis*

**20080001701** National Taiwan Univ., Taipei, Taiwan, Province of China

**Applications of Nanotechnology in Biomimetics and Quantum Computing**

Mou, Chung-Yuan; Oct 23, 2007; 4 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0118

Report No.(s): AD-A473229; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473229>

The application of pulsed electron paramagnetic resonance 'EPR' technique is used in quantum computing. Polarized electron spin created in the photo-excitation of organic molecules is used as the basis of quantum bit. The quantum coherence and superposition effects of the polarized electron spin at the level anti-crossing 'LAC' region under the influence of an external magnetic field and microwave pulses is examined. Highly polarized state is present only during the preparation of quantum states in the photo-excitation. Future work should focus on nuclear polarization enhancement by optical pumping in the LAC region.

DTIC

*Biomimetics; Electron Paramagnetic Resonance; Nanotechnology; Quantum Computation*

**20080001702** Pohang Univ. of Science and Technology, Pohang, Korea, Republic of

**Fabrications and Characterizations of ZnO/Zn(1-x)Mg(x)O Nanorod Quantum Structures**

Yi, Gyu-Chul; Nov 8, 2005; 12 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0462

Report No.(s): AD-A473230; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473230>

This project investigated photoluminescent properties of ZnO/ZnMgO coaxial nanorod heterostructures and ZnO/ZnMgO nanorod single-quantum-well structures (SQWs). Individual nanorod SQWs were characterized by scanning near-field optical microscopy.

DTIC

*Fabrication; Nanorods; Nanotechnology; Photoluminescence; Quantum Wells; Zinc Oxides*

**20080001905** Georgia Inst. of Tech., Atlanta, GA USA

**Modeling and Control of State-Affine Probabilistic Systems for Atomic-Scale Dynamics**

Gallivan, Martha A; Jun 2007; 56 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0183

Report No.(s): AD-A473352; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Under this research grant, the framework and tools were developed for model reduction of atomic-scale many body

systems. The state-affine mathematical structure of the original and reduced order models enabled the implementation of control through dynamic programming and estimation through an extended Kalman filter. The state of the high-dimensional stochastic system is first quantified using a high-dimensional pair correlation function. This state is then reduced using linear and nonlinear principal component analysis and is discretized using self-organizing maps. To create the dynamic model, a cell map is constructed using short simulations to quantify input-dependent transitions between the discrete states. The error associated with the model reduction was quantified and analyzed, and a method for predicting this error was proposed. Specific applications in materials processing were considered, which motivated and guided the development of the model reduction framework and tools. An existing model of gallium arsenide deposition was used to demonstrate the model reduction framework. A second modeling study in the molecular architecture of hyperbranched polymers was performed, and enabled a comparison of common themes and system specific features between the two different applications.

DTIC

*Atoms; Dynamic Programming; Gallium Arsenides*

**20080001909** Sydney Univ., Australia

**Simulation Studies of a Four Component Model of Zr-based Bulk Metallic Glass**

Miracle, Dan; Harrowell, Peter; Fernandez, Julian R; Oct 18, 2007; 14 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0274

Report No.(s): AD-A473357; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the work was to carry out simulation studies on the 5 component Vitreloy-1 metallic glass. This was to include the characterization of interaction potentials and the running of preliminary simulation calculations. One specific goal was to compare the outcomes of these calculations with the prediction of a crystal-based structural approximation to the amorphous state recently proposed by Miracle. To this end, a computational characterization of the Miracle periodic approximate (MPA) for binary and ternary mixtures of hard spheres was performed. A comparison of the MPA with a chemically ordered amorphous packing indicated that the MPA is successfully describing important features of the local structure of the amorphous state. Details of the study is presented in result section of the report.

DTIC

*Algorithms; Metallic Glasses; Simulation*

**20080001920** Engineering Technologies Associates, Inc., Ellicott City, MD USA

**Ground Water Flow Model at Fort Devens, Massachusetts**

May 24, 1993; 327 pp.; In English

Contract(s)/Grant(s): DAAA15-89-D-0009-0008

Report No.(s): AD-A473374; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this project was to develop a regional ground water flow model to assist in determination of cumulative impacts to ground water quality from the multiple contaminated sites at Fort Devens. Fort Devens is a U.S. Army post in Worcester and Middlesex counties in central Massachusetts. There are a number of contaminated and potentially contaminated areas on the post that are currently being studied. The geology of Fort Devens was chiseled by the continental glaciers of the Pleistocene epoch. The glaciers deepened existing river valleys by eroding the bedrock and depositing till (poorly sorted clay, silt, and sand), glacial outwash (well sorted, sandy deposits from rivers and melting glaciers), drumlins (hills of till), kames (hills of sand), kettles (depressions caused by buried blocks of ice that melt), and other landforms characteristic of glacial terrain. The bedrock beneath the unconsolidated glacial sediments consists primarily of metamorphic rocks (old crystalline rocks). Ground water exists at Fort Devens in two geologic formations. The primary aquifer is the glacial drift that overlies the bedrock. This aquifer consists of well sorted sands and gravels, fine sands, silt, and clay; and is known as the glacial outwash aquifer. It is capable of supplying large quantities of water. The aquifer is used by Fort Devens and nearby municipalities for water supply.

DTIC

*Aquifers; Contamination; Fluid Flow; Ground Water; Hydrology Models; Mathematical Models; Models; Water Flow; Water Quality*

**20080001955** Library of Congress, Washington, DC USA

**Perchlorate Contamination of Drinking Water: Regulatory Issues and Legislative Actions**

Tiemann, Mary; Apr 4, 2007; 7 pp.; In English

Report No.(s): AD-A473462; CRS-RS21961; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Perchlorate is the explosive component of solid rocket fuel, fireworks, road flares, and other products. Used mainly by

the Department of Defense (DOD) and related industries, perchlorate occurs naturally and is present in some organic fertilizer. This soluble, persistent compound has been detected in sources of drinking water for more than 11 million people. It also has been found in milk, fruits, and vegetables. Concern over the potential health risks of perchlorate exposure has increased, and some states and Members of Congress have urged the Environmental Protection Agency (EPA) to set a drinking water standard for perchlorate. The EPA has not determined whether to regulate perchlorate and has cited the need for more research on health effects, water treatment techniques, and occurrence. Related issues have involved environmental cleanup and water treatment costs, which will be driven by federal and state standards. Interagency disagreements over the risks of perchlorate exposure led several federal agencies to ask the National Research Council (NRC) to evaluate perchlorate's health effects and EPA's risk analyses. In 2005, the NRC issued its report, and the EPA adopted the NRC's recommended reference dose (i.e., the expected safe dose) for perchlorate exposure. However, new studies raise more concerns about potential health risks of low-level exposures, particularly for infants. Perchlorate bills in the 110th Congress include S. 150 and H.R. 1747, which direct the EPA to set a standard. This report reviews perchlorate water contamination issues and developments.

DTIC

*Chlorates; Contamination; Costs; Drinking; Health; Perchlorates; Potable Water; Risk; Water Pollution; Water Treatment*

**20080002136** Academy of Sciences (Russia), Moscow, Russian Federation

**Plasma Assisted Combustion**

Starikovskii, Andrei Y; Feb 28, 2007; 372 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8655-03-D-0001; Proj-RPO-1349-MO-02

Report No.(s): AD-A473196; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473196>

This report results from a contract tasking Moscow Institute of Physics and Technology as follows: The contractor will investigate the use of high voltage, nano-second plasma discharges to ignite and efficiently combust fuel/air mixtures in high speed flows. This strongly nonequilibrium low-temperature plasma has a high mean energy of electrons and will provide a source of reactive atoms, radicals, and excited molecules which has been shown to enhance ignition and combustion. The short duration of the pulses results in relatively low power requirements for generating the discharge. The goal is to demonstrate and understand the physics of energy exchange, ignition and combustion. Also, the use of this type of plasma for aerodynamic flow control will be investigated. Finally, applicability to use this type of discharge to directly initiate a detonation wave will be investigated.

DTIC

*Combustion; Electric Fields; Ignition; Plasmas (Physics)*

**20080002138** Lawson (Harding) Associates, Portland, ME, USA

**Pilot-Scale Evaluation of Hydrogen Release Compound for Enhanced In-Situ Bioremediation at AOC 50**

Apr 2000; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DACA31-94-D-0061; Proj-44953

Report No.(s): AD-A473174; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473174>

Remedial investigation activities at Area of Contamination (AOC) 50 at Devens Reserve Forces Training Area (RFTA) have identified a plume of tetrachloroethene (PCE) contaminated groundwater migrating from a source area near Building 3840 toward the Nashua River approximately 3,000 feet away (Figure 1). As part of the Remedial Investigation/Feasibility Study Process, several potential approaches will be evaluated for cleanup of source-area and groundwater contamination. In support of the feasibility study, the Army has directed HLA to perform a pilot-scale test of one of the potential remedies: enhanced in-situ bioremediation. The chlorinated solvent PCE degrades only slowly by biological processes under aerobic conditions. Degradation is relatively rapid, however, under anaerobic conditions, and, through a process called reductive dechlorination, PCE is sequentially degraded/transformed to the daughter products trichloroethene (TCE), dichloroethene (DCE), vinyl chloride (VC), and ultimately to innocuous nonchlorinated compounds. The presence of low concentrations of DCE and VC near the AOC 50 source suggests that some anaerobic degradation has taken place, but the high concentrations of PCE, presence of dissolved oxygen, and low concentrations of total organic carbon suggest that conditions are not favorable for it to continue. The degradation sequence is shown below.

DTIC

*Biodegradation; Biological Effects; Contamination; Ground Water; Hydrogen; Hydrogen Compounds; Organic Materials; Waste Treatment; Water Pollution*

**20080002351** Air Force Research Lab., Edwards AFB, CA USA

**Boron Nitride Sputter Erosion Measurements by Cavity Ring-Down Spectroscopy (Preprint)**

Yalin, Azer P; Tao, Lei; Yamamoto, Naoji; Smith, Timothy B; Gallimore, Alec D; Sep 6, 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-4847

Report No.(s): AD-A473501; AFRL-PR-ED-TP-2007-405; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473501>

Sputter erosion is a critically important process in many electric propulsion (EP) devices from the point of view of both lifetime assessment and contamination effects. In many Hall thrusters erosion of boron nitride (BN) is of primary interest. In this contribution we introduce the use of cavity ring-down spectroscopy (CRDS) as a diagnostic for measurement of sputtered BN. The measurement approach is based upon probing sputtered boron atoms in the region of 250 nm. We report proof of principle CRDS measurements of sputtered boron atoms from both boron and BN targets. The measurements are obtained with pulsed CRDS in a diagnostic chamber consisting of an ion beam incident on the target materials. We also outline the design of a higher sensitivity continuous-wave (cw) CRDS system using the fourth harmonic beam from an external cavity diode laser as the light source. The cw-CRDS system will be used for near real time sputter erosion measurements of thruster devices. Anticipated signal levels and signal-to-noise for the cw-CRDS system are discussed.

DTIC

*Boron; Boron Nitrides; Cavities; Continuous Radiation; Erosion; Hall Thrusters; Spectroscopy*

**20080002355** Air Force Research Lab., Edwards AFB, CA USA

**Experimental and Numerical Examination of a Hall Thruster Plume (Preprint)**

Nakles, Michael R; Brieda, Lubos; Reed, Garrett; Hargus Jr, William A; Spicer, Randy L; Jul 31, 2007; 20 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473510; AFRL-PR-ED-TP-2007-380; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473510>

The plume of a Busek BHT-200 xenon Hall thruster has been characterized through measurements from various plasma electrostatic probes. Ion current flux, plasma potential, plasma density, and electron temperatures were measured from the near-field plume to 60 cm downstream of the exit plane. These experimentally derived measurements were compared to numerical simulations run with the plasma plume code DRACO. A major goal of this study was to determine the fidelity of the DRACO numerical simulation. The effect of background pressure on the thruster plume was also examined using ion current flux measurements at higher than nominal pressure.

DTIC

*Computerized Simulation; Hall Thrusters; Plasmas (Physics); Plumes*

**20080002357** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Polyarylenethioethersulfone Membranes for Fuel Cells (Postprint)**

Rodrigues, Stanley J; Reitz, Thomas L; Sep 2007; 12 pp.; In English

Contract(s)/Grant(s): Proj-3145

Report No.(s): AD-A473512; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473512>

High performance, sulfonated polyarylenethioethersulfone (SPTES) polymers have been developed as membranes for fuel cells. These high molecular weight polymers synthesized by a polycondensation process have an aromatic backbone along with high sulfonic acid content that provides for their high conductivity and robust mechanical properties. Bulky phenyl-based end-capping agents are incorporated into the system to maintain high water stability and retain high proton conductivity. Films with good mechanical properties were obtained by solvent casting. SPTES polymer systems with a 50% degree of sulfonation (SPTES-50) exhibited high proton conductivity (>100 mS/cm) at 65 °C and 85%RH. Membrane electrode assemblies (MEAs) fabricated using SPTES-50 electrolytes that incorporate conventional electrode application techniques have shown high proton mobility. Electrochemical evaluation was performed using nonlinear regression analysis to obtain Tafel parameters. The electrochemical performance of SPTES-50 was comparable to Nafion<sup>®</sup>. Electrochemical impedance spectra were analyzed in terms of a pore diffusion model. Catalyst utilization for SPTES MEAs using conventional electrode inks with perfluorinated binders was similar to that exhibited by Nafion<sup>®</sup>. Estimates of hydrogen fuel permeability based upon measured open circuit voltage indicate that SPTES-50 MEAs exhibit a slightly higher rate of fuel crossover compared to Nafion<sup>®</sup>. Thermogravimetric analysis shows good thermal stability. The high temperature stability (up to 250 °C) and high intrinsic proton conductivities



of SPTES-50 qualifies it to be a potential candidate for membranes in fuel cells.

DTIC

*Fluorination; Fuel Cells; Membranes; Polymers; Sulfonic Acid*

**20080002364** Massachusetts Inst. of Tech., Cambridge, MA USA

**Micro Chemical Oxygen-Iodine Laser (COIL)**

Livermore-Clifford, Carol; Oct 2007; 126 pp.; In English

Contract(s)/Grant(s): HR0011-04-C-0140

Report No.(s): AD-A473525; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473525>

It has been previously proposed to improve the performance and compactness of chemical oxygen-iodine lasers (COIL) through the replacement of some of their macroscale components with arrays of higher-performing microscale (MEMS) components. In this program, a MEMS singlet oxygen generator (SOG) to power a COIL laser was designed, microfabricated from silicon and glass wafers, and successfully demonstrated. The MEMS SOG contained an array of reaction channels for the chemical reaction of BHP and chlorine gas, a liquid-gas separator based on capillary effects, and integrated heat exchangers for thermal management. The MEMS SOG was shown to have high singlet delta oxygen yield, high output flow rates, and an ability to operate in near single-pass reactant utilization. The results were also shown to agree with the models. In addition, devices for a second generation MEMS COIL system (second generation MEMS SOG, MEMS steam generators to power ejector pumps, and component interfaces) were designed. Based on its models, the second generation MEMS SOG is predicted to operate at four times higher flow rates than the first generation MEMS SOG. Based on its models, the MEMS steam ejectors are predicted to offer a low vibration, compact source of driving fluid for a COIL pumping system.

DTIC

*Chemical Lasers; Chemical Oxygen-Iodine Lasers; Chemical Reactions; Iodine; Microelectromechanical Systems; Oxygen*

**20080002367** Air Force Research Lab., Wright-Patterson AFB, OH USA

**In Situ Grafting of Hyperbranched Poly(Etherketone)s onto Multiwalled Carbon Nanotubes Via A3 + B2 Approach (Preprint)**

Tan, Loon-Seng; Choi, Ja-Young; Oh, Se-Jin; Lee, Hwa-Jeong; Baek, Jong-Beom; Wang, David H; Apr 2007; 31 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A473530; AFRL-ML-WP-TP-2007-485; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473530>

Trimesic acid and phenyl ether were in situ polymerized as A3 and B2 monomers, respectively, in the presence of a fixed amount (10 wt%) of multi-walled carbon nanotube (MWNT) to afford hyperbranched poly(etherketone)s (PEKs)/MWNT nanocomposites. The feed ratios of A3 and B2 monomers vary from 3:2 to 1:2 in the A3 + B2 polycondensations. The polymerization was carried out in a mildly acidic medium, i.e., poly(phosphoric acid) or PPA, with an optimized amount of phosphorus pentoxide (P2O5) added. The overall evidence based on the data of elemental analysis (EA), thermogravimetric analysis (TGA), fourier-transform infrared (FT-IR) spectroscopy as well as scanning electron microscopy (SEM) implicates that hyperbranched PEKs were attached to the surface of MWNT to form hyperbranched PEK-g-MWNT nanocomposites. Furthermore, MWNT remained structurally intact under the polymerization and work-up conditions. Evidently driven by the molecular architecture of globular hyperbranched polymers, the morphology of the nanocomposites resembles 'mushroom-like clusters on MWNT stalks.' The hyperbranched PEK-g-MWNT nanocomposites were soluble in polar aprotic solvents stemming from numerous carboxylic acids on their surfaces. When some of the samples were dispersed in 1 molar LiOH aqueous solutions, they formed very stable suspensions. The resulting lithiated nanocomposites are being investigated in the applications such as ion conductivity and energy capacitance.

DTIC

*Carbon Nanotubes; Grafting*

**20080002437** Army Research Lab., Aberdeen Proving Ground, MD USA

**Examination of the Thermal Ignition of M30 Propellant by Residual Steel Fragments**

Bates, Kyle; Raftenberg, Martin; Meyer, Hubert; Gerri, Norman; Sep 2007; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473656; ARL-TR-4242; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473656>

We report the results of a set of experiments designed to determine the threshold ignition striking velocity ( $V_s$ ) of fragment simulating projectiles (FSP) that perforate a plate of titanium armor and come to rest in a bed of M30 propellant. A subset of experiments, which focus on an 830 grain (gr) FSP shot through 0.25 in. thick titanium, are modeled using physics-based computer codes. The modeling approach employs two codes in series, an Eulerian shock-physics code (CTH) to model the armor perforation event and a Lagrangian hydrocode (LS-DYNA) to model the thermal conduction between the FSP and propellant. The computer modeling was designed in the interest of creating predictive methodology for evaluating survivability and lethality. The research was funded by the U.S. Army Research Laboratory (ARL) Director's Research Initiative.

DTIC

*Fragments; Ignition; Propellants; Steels; Thermodynamic Properties*

**20080002560** Tokyo Inst. of Tech., Yokohama, Japan

**Combustion Synthesis Technology Applied to In-situ Resource Utilization**

Odawara, Osamu; Jun 15, 2006; 15 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0400

Report No.(s): AD-A473708; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Solution combustion synthesis is different from solid and gas combustion in the presence of water. Fuels from natural resources were applied to the solution combustion of 'SrAl<sub>2</sub>O<sub>4</sub>: Eu, Dy' compounds and properties of the products were studied. Technology to develop non-aggregating particles can be established with uniformly dispersed compounds.

DTIC

*Combustion; Combustion Synthesis*

**20080002576** Universal Energy Systems, Inc., Dayton, OH USA

**Platinum Acetylide Two-Photon Chromophores (Preprint)**

Burke, Aaron R; Cooper, Thomas M; Rogers, Joy E; Slagle, Jonathan E; Krein, Douglas M; Hall, Benjamin C; Fratini, Albert; McLean, Daniel G; Apr 2007; 62 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473734; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To explore the photophysics of platinum acetylide chromophores having strong two photon cross section, we have investigated the synthesis and spectroscopic characterization of a series of platinum acetylide complexes that feature highly  $\pi$ -conjugated ligands substituted with  $\pi$ -donor or  $\pi$ -acceptor moieties. The molecules (numbered 1-4) considered in the present work are NLO-functionalized analogs of bis(phenylethynyl)bis(bributylphosphine)platinum(II) complexes. Molecule 1 carries two benzothiazolylfluorene and molecule 2 carries two diphenylaminofluorene substituents bound to the central platinum atom. Compounds 3 and 4 possess two dihexylaminophenyl substituents at their ends and differ by the number of platinum atoms in the oligomer 'core' (one vs. two in 3 and 4, respectively). The conjugated ligands impart the complexes with effective two-photon absorption cross sections, while the heavy metal platinum centers give rise to efficient intersystem crossing to afford long lived triplet states. Photophysical studies demonstrate that one-photon excitation of the chromophores produces an  $S_1$  state that is delocalized across the two conjugated ligands, with weak (excitonic) coupling through the platinum center(s). The  $S_1$  state is observed by ultrafast transient absorption and by its characteristic fluorescence. Intersystem crossing occurs rapidly ( $k_{isc} \approx 10^{11} \text{ s}^{-1}$ ) to produce the  $T_1$  state, which is believed to be localized on a single conjugated fluorenyl ligand. The triplet state is strongly absorbing ( $\epsilon_{TT} > 5 \times 10^4 \text{ M}^{-1}\text{cm}^{-1}$ ) and it is very long-lived ( $\tau > 100 \mu\text{s}$ ). Femtosecond pulses were used to characterize the two-photon absorption properties of the complexes, and all of the chromophores are relatively efficient two photon absorbers in the visible and near-infrared region of the spectrum (600 - 800 nm). The complexes exhibit maximum

DTIC

*Chromophores; Oligomers; Photons; Platinum*

**20080002581** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Femtosecond Laser Threshold and Nonlinear Characterization in Bulk Transparent SiC Materials (Preprint)**

Brewer, Chris; Juhl, Shane; DesAutels, G L; Powers, Peter; Walker, Mark; Finet, Marc; Ristich, Scott; Whitaker, Matt; Aug 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473741; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Semi-insulating and conducting SiC crystalline transparent substrates were studied after being processed by femtosecond laser radiation. Z-scan and damage threshold experiments were performed on both SiC bulk materials to determine each samples' nonlinear and threshold parameters. 'Damage' in this text refers to an index of refraction modification as observed visually under an optical microscope. In addition, a study was performed to understand the damage threshold as a function of numerical aperture.

DTIC

*Characterization; Lasers; Nonlinearity; Silicon Carbides; Transparence*

**20080002584** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Liquid Crystal Bragg Gratings: Dynamic Optical Elements for Spatial Light Modulators (Postprint)**

Wofford, J M; Evans, D R; Bunning, T J; Sutherland, R L; Tondiglia, V P; Natarajan, L V; Siwecki, S A; Cook, G; Lloyd, P F; Jan 2007; 17 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473745; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bragg gratings yield a single diffracted order when irradiated by a coherent beam at the appropriate Bragg angle. In many cases, nearly all of the energy of the incident beam can be coupled to the diffracted beam. Hence these gratings can form many useful optical elements, and this has been realized in 1-D, 2-D, and 3-D photonic crystals. Bragg gratings made with liquid crystals offer the added dimension of dynamic properties through the large electro-optical effect in liquid crystals. Applications for spatial light modulators are numerous, including optical switches, modulators, active optical elements (e.g., lenses), laser sources, and tunable filters. We have been exploring a number of approaches for making liquid crystal Bragg gratings, including holographic polymer-dispersed liquid crystals, cholesteric liquid crystals, and homogenous nematic liquid crystals in hybrid devices. We have studied the dynamic properties of these Bragg gratings by electrical, thermal, and optical stimulation. Modification and control of optical and dynamic properties have been obtained through combinations of liquid crystals with polymers, combinations of various dopant materials, and interactions of liquid crystals with organic and inorganic interfaces. We discuss the materials, fabrication, characterization, and physics of liquid crystal Bragg gratings and present the results of various devices we have studied in our lab. We will also discuss potential applications.

DTIC

*Bragg Angle; Light Modulators; Liquid Crystals*

**20080002586** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Ambient Volatility of Bis-(2-Chloroethyl) Sulfide**

Buchanan, James H; Buettner, Leonard C>; Tevault, David E; Oct 2007; 18 pp.; In English

Contract(s)/Grant(s): Proj-6RAWX2

Report No.(s): AD-A473747; ECBC-TR-580; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The volatility of bis-(2-chloroethyl) sulfide (HI) has been measured in the presence of water vapor using methodology recently developed at the U.S. Army Edgewood Chemical Biological Center. Contrary to predictions based on ideal behavior as described by Raoult's Law, the volatility of HI) is virtually independent of ambient humidity. This result suggests that the re-evaporation of HI) after deposition into the environment is a function of temperature, wind speed, and interactions with materials on which deposition takes place, but it is not influenced by ambient humidity.

DTIC

*Gas Chromatography; Sulfides; Vapor Pressure; Volatility; Water Vapor*

**20080002587** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Vapor Pressure of GD**

Balboa, Alex; Buchanan, James H; Buettner, Leonard C; Sewell, Tara; Tevault, David E; Oct 2007; 20 pp.; In English

Contract(s)/Grant(s): Proj-6RHAX1

Report No.(s): AD-A473748; ECBC-TR-575; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The vapor pressure of pinacolyl methyl phosphonofluoridate [O-( I ,2,2-trimethylpropyl)-methyl phosphonofluoridate.

GD] has been measured between -20 and 50 C, using vapor saturation methodology. The current data are in good agreement with data previously measured.

DTIC

*Methyl Compounds; Vapor Pressure*

**20080002594** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Mechanism of Hydrogen Production in [Fe-Fe]-Hydrogenase: A Density Functional Theory Study (Postprint)**

Pachter, Ruth; Trohalaki, Steven; Mar 2007; 12 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473756; AFRL-ML-WP-TP-2007-549; No Copyright; Avail.: Defense Technical Information Center (DTIC)

[Fe-Fe]-hydrogenases are a class of metallo-enzymes that catalyze the production of H<sub>2</sub> from two protons and two electrons. In this work, we used density functional theory (DFT) calculations to analyze the mechanism of hydrogen production, providing insight into the role of the intermediates in the catalysis. We also validated the exchange-correlation functional applied within DFT for model compounds of the active site in [Fe-Fe]-hydrogenase, enabling us a reliable application for understanding previously established hydrogen production hypotheses, as well as providing a starting point for a future investigation of the effects of the protein environment on the catalytic mechanism of [Fe-Fe]-hydrogenases.

DTIC

*Density Functional Theory; Fuels; Hydrogen; Hydrogen Production; Iron*

**20080002605** National Taiwan Univ., Taipei, Taiwan, Province of China

**Growth, Characterization, and Application of InGaN with the Full-range Indium Content**

Yang, Chih-Chung; Jan 31, 2006; 33 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0440

Report No.(s): AD-A473773; No Copyright; Avail.: Defense Technical Information Center (DTIC)

InGaN was grown, covering the entire indium composition range, to characterize the various compositions of the material and to implement white-light generation.

DTIC

*Crystals; Indium; Vapor Deposition*

**20080002633** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Effects of Conjugation in Length and Dimension on Two-Photon Properties of Fluorene-Based Chromophores (Preprint)**

Pachter, Ruth; Nguyen, Kiet A; Day, Paul N; Kannan, Ramamurthi; Jan 2007; 21 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473820; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report the computed two-photon (TPA) absorption spectra based upon the results obtained from quadratic response time-dependent density functional theory for fluorine-based donor-pi-acceptor molecules. Coulomb attenuated functionals with a long-range exchange contribution are applied to predict TPA excitation energies and cross sections and to account for the observed spectral anomalies. The effects of conjugation and multibranching on the TPA spectra are discussed.

DTIC

*Chromophores; Conjugation; Length; Photons; Time Dependence*

**20080002642** Army Construction Engineering Research Lab., Champaign, IL USA

**Solubility and Phase Behavior of CL20 in Supercritical Fluids**

Boddu, Veera; Toghiani, Rebecca K; Damavarapu, Reddy; Sep 2006; 49 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473836; ERDC/CERL-TR-06-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The solubility of CL20 in supercritical carbon dioxide (CO<sub>2</sub>) was evaluated using the Peng-Robinson cubic equation of state. Thermodynamic properties of CL20 were required for this estimation. A comprehensive search of the literature revealed little data regarding the critical point of the compound. Also lacking were vapor pressure data for the compound. Critical properties as well as other required thermodynamic properties were estimated using a variety of available estimation techniques, including the group contribution methods of Lydersen and of Joback. The solubility of CL20 in supercritical CO<sub>2</sub> was estimated using a Fortran program developed during the course of this project. Estimations spanned a reduced temperature

range of 1.003 to 1.21 K and a reduced pressure range of 1.01 to 2.06 atm with respect to CO<sub>2</sub>. The Fortran program was validated using available literature data for the solubility of naphthalene and of biphenyl in supercritical CO<sub>2</sub>. The applicability of the estimation techniques employed for the critical properties for CL20 was established using these same techniques to estimate the critical properties of comparable compounds, including RDX and HMX. Solubility data for RDX in supercritical CO<sub>2</sub> reported in the literature were also used to establish the validity of the estimation approach.

DTIC

*Carbon Dioxide; Equations of State; Solubility; Supercritical Fluids*

**20080002668** Delphi Corp., Troy, MI USA

**MEANS2: Knowledge Oriented Materials Engineering of Layered Thermal Barrier Systems (NOMELT)**

Smith, John R; Jun 4, 2007; 3 pp.; In English

Contract(s)/Grant(s): FA9550-05-C-0039

Report No.(s): AD-A473891; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The hot-section turbine components of aircraft engines can depend on a thermally-grown, thin alpha-alumina layer for corrosion and oxidation protection. This thermal processing can leave a continuous layer of gamma-Ni (Al) adjacent to the oxide. Since the oxide must remain adherent upon thermal cycling, it is essential to quantify the factors affect adhesion at the gamma-Ni (Al) /alpha-alumina interface. We have previously shown that this adhesion is sensitive to the stoichiometry or atomic termination of the interface and that this stoichiometry depends on the Al activity in the Ni (Al). It was required then to determine the temperature and Al concentration dependence of the Al activity in Ni(Al). This was done via first principles, density functional theory. Results indicate that the Al activity can vary by 14 orders of magnitude over a temperature range 400 K < T < 1700 K. We find the interface stoichiometry to be Al-rich, but located near the stoichiometric phase on the phase diagram. Software we developed for activity computations is available on request.

DTIC

*Expert Systems; Knowledge Representation; Protective Coatings; Turbines*

**20080002801** Army Research Lab., Adelphi, MD USA

**Preparation of Nanoporous Silicon**

Churaman, Wayne A; Currano, Luke; Oct 2007; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473887; ARL-TR-4306; No Copyright; Avail.: Defense Technical Information Center (DTIC)

While research has focused on the optical properties of nanoporous silicon and its use as an isolation material in integrated circuits, there is a great deal to be gained by understanding the formation process of such a versatile material. The structure itself is made up of millions of pores that are formed through an electrochemical wet etch, which results in network clusters of nanoporous material with a surface area on the order of 50 m<sup>2</sup>/g. In this report, we explore the process of preparing the nanoporous silicon, while presenting solutions to some of the challenges that arise during the pore formation. These challenges include cracking of the nanoporous layer when attempting to etch pores with a vertical depth greater than ~35 μm, as well as effects of electric field concentrations in the etch process, which degrade structural integrity. In addition we provide a quantitative analysis of the material's structural layer and present an alternative approach to the current wet etching technique.

DTIC

*Electric Fields; Etching; Quantitative Analysis; Silicon; Structural Failure*

**20080002819** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Ignition and Detonation Characteristics of Hydrogen and Hydrocarbon Fuels in a PDE**

Heifrich, Tim; Schauer, Fred; Bradley, Royce; Hoke, John; Sep 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-3048

Report No.(s): AD-A473507; AFRL-RZ-WP-TP-2007-243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473507>

Over the past two decades, several fuels have been tested in pulsed detonation engines (PDEs) throughout the world. This research focuses on developing a baseline set of ignition and detonation performance measures for six distinct fuels in air: Hydrogen, ethylene, propane, aviation gasoline (avgas), JP-8, and Fischer-Tropsch JP-8 (S-8). To quantify the ignition and detonation performance, four parameters are examined: Ignition time, deflagration- to-detonation transition (DDT) time, DDT distance, and the upper Chapman-Jouguet (CJ) wavespeed. Those four parameters are presented as a function of equivalence ratio from lean to rich flammability limits for all six fuels. Hydrogen was found to have the best ignition and detonation

characteristics, followed by ethylene. Propane, avgas, JP-8, and S-8 exhibited similar ignition and detonation characteristics, as expected based on cell size. Minimum ignition times for all fuels occurred near an equivalence ratio of 1.3, while the minimum DDT times and distances occurred between equivalence ratios of 1.1 and 1.2. All experimental CJ wavespeeds were within 5% of the theoretical CJ wavespeed with the exception of hydrogen, which was systematically between 6% and 8% lower than the theoretical value.

DTIC

*Detonation; Fuels; Hydrocarbon Fuels; Hydrocarbons; Hydrogen; Hydrogen Fuels; Ignition*

**2008002891** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Biological Assembly of Hybrid Inorganic Nanomaterials (Preprint)**

Naik, Rajesh R; Slocik, Joseph M; Mar 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473733; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The assembly of two or more inorganic nanoparticles results in hybrid materials with enhanced properties. These include improvements in catalytic activity, changes in optical behavior and potential gains in electronic properties. However, these are only attained through precise synthetic control of the resulting material with respect to structure, organization, size, and composition. Fortunately, biological systems are exceptional at the synthesis and assembly of diverse inorganic materials at many different length scales; and as result, has inspired many different approaches toward the biomimetic synthesis of hybrid inorganic materials.

DTIC

*Inorganic Materials; Catalytic Activity; Electrical Properties; Nanoparticles; Genetic Engineering*

**20080012232** American Cyanamid Co., Stamford, CT USA

**Aqueous chemiluminescent systems**

Mohan, Arthur Gaudens, Inventor; October 11, 1977; 6 pp.; In English

Contract(s)/Grant(s): NAS5-22303

Patent Info.: Filed July 16, 1976; US-PATENT-4,053,430; US-PATENT-APPL-SN-705863; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012232>

This invention relates to novel water-soluble esters of oxalic acid, and to compositions that are useful for generating chemiluminescent emission by reacting said esters of oxalic acid with hydrogen peroxide in the presence of water and a fluorescent compound, and to a process for generating chemiluminescent emission by using said compositions.

Official Gazette of the U.S. Patent and Trademark Office

*Chemiluminescence; Esters; Hydrogen Peroxide; Oxalic Acid; Water*

**20080012260** California Inst. of Tech., Pasadena, CA USA

**Cationic vinyl pyridine copolymers and products thereof**

Rembaum, Alan, Inventor; January 17, 1978; 7 pp.; In English

Patent Info.: Filed June 26, 1973; US-PATENT-4,069,365; US-PATENT-APPL-SN-373616; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012260>

Quaternized, cross-linked, insoluble copolymers of unsubstituted and substituted vinyl pyridines and a dihalo organic compound are spontaneously formed at ambient temperature on mixing the two monomers in bulk, in solution or in suspension. The amount of cross-linking may be varied according to the composition and reaction conditions. The polymer product exhibits ion exchange capacity and undergoes a reversible color change from black at a pH above 7 to yellow at a pH below 7. The polymer may be formed in the presence of preformed polymers, substrates such as porous or impervious particles or films to deposit an ion exchange film in situ or on the surface of the substrate. The coated or resin impregnated substrate may be utilized for separation of anionic species from aqueous solution.

Official Gazette of the U.S. Patent and Trademark Office

*Ambient Temperature; Crosslinking; Monomers; Organic Compounds; Pyridines; Solubility; Vinyl Copolymers*

**20080012264** California Inst. of Tech., Pasadena, CA USA

**Novel fluorohydrocarbons**

Scherer, Kirby V., Inventor; November 6, 1979; 6 pp.; In English

Patent Info.: Filed January 3, 1977; US-PATENT-4,173,654; US-PATENT-APPL-SN-756011; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012264>

Novel fluorohydrocarbons include a fluoroalkyl unit terminating in a tertiary carbon atom which is directly linked to an aliphatic moiety of the compound. The compounds contain at least 9 carbon atoms and usually no more than 13 carbon atoms. The compounds are synthesized by addition of a fluoride atom to the tertiary carbon atom of a fluorocarbon material to form a carbanion followed by alkylation of the carbanion. The fluorohydrocarbons will find use as blood substitutes or as electronic fluids.

Official Gazette of the U.S. Patent and Trademark Office

*Aliphatic Compounds; Carbon; Fluorohydrocarbons*

**20080012297** NASA, Washington, DC USA

**Ethynyl terminated imidothioethers and resins therefrom**

Hergenrother, Paul M., Inventor; Connell, John W., Inventor; Bass, R. Gerald, Inventor; August 29, 1989; 6 pp.; In English

Patent Info.: Filed July 14, 1988; US-PATENT-4,861,882; US-PATENT-APPL-SN-218792; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012297>

Ethynyl terminated imidothioethers (ETIs) are prepared by the reaction of a dimercaptan, such as 4,4'-dimercaptodiphenyl ether, and an ethynyl containing maleimide, such as N-(3-ethynylphenyl)maleimide. Blends of these ETIs and ethynyl terminated polymeric materials, such as ethynyl terminated sulfones and ethynyl terminated arylene ethers, are also prepared. These resin blends exhibit excellent processability, and the cured blends show excellent fracture toughness and solvent resistance, as well as excellent adhesive and composite properties.

Official Gazette of the U.S. Patent and Trademark Office

*Ethers; Resins*

**26**

**METALS AND METALLIC MATERIALS**

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

**20080000604** Case Western Reserve Univ., Cleveland, OH USA

**Magneto-Optical Properties of Hybrid Magnetic Material Semiconductor Nanostructures**

Lambrecht, Walter R; Sep 14, 2007; 12 pp.; In English

Contract(s)/Grant(s): NOOOL4-02-1-0880

Report No.(s): AD-A472402; No Copyright; Avail.: Defense Technical Information Center (DTIC)

First-principles calculations were performed of a variety of materials systems of potential interest in spintronics. A comprehensive study was made of transitional metal doping in SiC and their magnetic properties. The trends in magnetic properties and in the preference for rocksalt versus zincblende structure were studied for the entire series of transition metal nitrides. The LSDA+U method was implemented in the FP-LMTO approach and applied to rare-earth nitrides and related compounds. A study was made of half-metallicity in zincblende transition metal compounds. A study was made of Mn doping of ScN. It was found to be a potentially interesting dilute magnetic semiconductor system. Exchange interactions in this system were calculated using a linear response approach and cluster variation method calculations indicate a  $T_c$  above room temperature should be feasible in this material. Calculations of the optical spectra of antiferromagnetic MnN were compared with experimental data.

DTIC

*Magnetic Materials; Magnetic Properties; Magneto-Optics; Nanostructures (Devices); Semiconductors (Materials)*

**2008000616** Cornell Univ., Ithaca, NY USA

**Robust Multi-Length Scale Deformation Process Design for the Control of Microstructure-Sensitive Material Properties**

Zabaras, Nicholas; Jul 18, 2007; 26 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0070

Report No.(s): AD-A472450; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this work was to develop a robust design methodology for optimizing microstructure-sensitive properties in aircraft components manufactured using metal forming processes. The multi-scale forming design simulator developed provides means to select the sequence of deformation processes, design the dies and preforms for each process stage as well as the process conditions such that a product is obtained with desired shape and microstructure. Modeling of uncertainty propagation in such multi-scale models of deformation is extremely complex considering the nonlinear coupled phenomena that need to be accounted for. The work addresses key mathematical and computational issues related to robust multi-scale design of deformation processes. Our research accomplishments include development of new mathematical models based on spectral polynomial chaos, support space, and entropy maximization techniques for modeling sources of uncertainties in material deformation processes. These models, in conjunction with multi-scale homogenization models, allow simulations of the effect of microstructural variability on the reliability of macro-scale systems. We have developed the first stochastic variational multi-scale simulator with an explicit sub-grid model, a robust deformation process simulator using spectral and collocation methods for simulating uncertainties in metal forming processes. Finally, recent developments including an information theoretic framework for modeling microstructural uncertainties is summarized.

DTIC

*Deformation; Microstructure; Sensitivity; Stochastic Processes*

**20080001000** Georgia Inst. of Tech., Atlanta, GA USA

**Effect of Thermo-Mechanical Treatment on Texture and Microstructure Evolution of Polycrystalline Alpha Titanium**

Garmestani, Hamid; Oct 14, 2005; 9 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0011

Report No.(s): AD-A472627; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472627>

The present work attempts to establish a unified path model for characterization as well as prediction of microstructure evolution in terms of texture and micro-texture, in commercially pure titanium that has undergone thermo-mechanical processing. Two deformation temperatures, room temperature (cold rolling) and 260C (warm rolling), and five different deformation levels of 20%, 40%, 60%, 80% and 95% were used in the present investigation. In this report only the experimental results of texture analysis is presented. The modeling of processing path model, texture evolution and the experimental results for other temperature ranges will be presented elsewhere.

DTIC

*Microstructure; Polycrystals; Textures; Thermodynamics; Titanium*

**20080001218** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Alloying Solid Solution Strengthening of Fe-Ga Alloys: A First-Principle Study**

Chen, Kuiying; Cheng, Leon M; Jan 2006; 12 pp.; In English

Contract(s)/Grant(s): 05-C-0165-SUB-2

Report No.(s): AD-A472974; No Copyright; Avail.: Defense Technical Information Center (DTIC)

First-principles spin polarized calculations have been implemented by using the Discrete Molecular 'DMol3' package to investigate the strengthening effect from alloying additions of Nb, Mo, V, Cr and Co in cubic solid solution of Fe-Ga alloys. Mayer bond order 'BO' values were used to evaluate the atomic bond strengths in the alloys, and were then used to assess the alloying strengthening characteristics. Results from the calculation suggested that transition metal Nb achieves the best strengthening effect in Fe-Ga alloys. The solid solution strengthening follows a trend from larger to smaller by Nb, Mo, V, Cr and Co. The effect of Ga on individual bond strength variation between Fe and alloying elements and also on alloying strengthening was examined.

DTIC

*Alloying; Gallium Alloys; Iron Alloys; Solid Solutions*



**20080001501** Fracture Technology Associates, Pleasant Valley, PA USA

**SR-1447 Fracture Mechanics Characterization of Aluminum Alloys for Marine Structural Applications**

Donald, J K; Jan 2007; 258 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707-053033/001/HAL

Report No.(s): AD-A472802; FTA-SSC-10624-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Ship Structure Committee (SSC) identified a lack of information required for structural integrity and damage tolerance analyses of aluminum marine structures. The development of such data is vital in light of the increased use of aluminum alloys in marine construction. Under SSC project SR-1447, Fracture Technology Associates was contracted to characterize, through experimental fracture mechanics, the fatigue crack growth (FCG) resistance and fracture toughness of three aluminum alloys (5083, 5086, 5383) used in marine structural applications. Fatigue crack growth testing was performed following ASTM Standard E 647-00 in laboratory air at room temperature and in simulated ocean water per ASTM Standard D 1141. Non-linear fracture toughness testing was performed in accordance with ASTM Standard E 1820-01 in laboratory air at room temperature. For the three different grades of material, the difference in fatigue crack growth rate in laboratory air was negligible. In simulated seawater environment, AA5086 showed a slightly superior performance. In addition, all samples showed the same ranking of toughness with the 5086 showing the highest toughness, followed by 5083 and then 5383.

DTIC

*Aluminum Alloys; Crack Propagation; Fracture Mechanics; Marine Technology; Structural Design*

**20080001613** NASA Langley Research Center, Hampton, VA, USA

**Validation Test Results for Orthogonal Probe Eddy Current Thruster Inspection System**

Wincheski, Russell A.; November 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 377816.06.02.03.05

Report No.(s): NASA/TM-2007-215087; L-19426; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001613>

Recent nondestructive evaluation efforts within NASA have focused on an inspection system for the detection of intergranular cracking originating in the relief radius of Primary Reaction Control System (PCRS) Thrusters. Of particular concern is deep cracking in this area which could lead to combustion leakage in the event of through wall cracking from the relief radius into an acoustic cavity of the combustion chamber. In order to reliably detect such defects while ensuring minimal false positives during inspection, the Orthogonal Probe Eddy Current (OPEC) system has been developed and an extensive validation study performed. This report describes the validation procedure, sample set, and inspection results as well as comparing validation flaws with the response from naturally occurring damage.

Author

*Eddy Currents; Inspection; Nondestructive Tests; Probes; Thrusters; Orthogonality*

**20080001633** Monash Univ., Clayton, Australia

**Production of Dense Compact Billet From Ti-Alloy Powder Using Equal Channel Angular Extrusion**

Lapovok, Rimma; Tomus, Dacian; Apr 6, 2007; 50 pp.; In English

Contract(s)/Grant(s): FA5209-05-C-0034

Report No.(s): AD-A473093; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473093>

The project was aimed at an investigation of the potential for cost-effective, efficient consolidation of pre-alloyed 'PA' Ti-6Al-4V (HDH) powder at temperatures of 400-C and below using Equal Channel Angular Extrusion (ECAE), with applied back pressure. The limit on processing temperature was imposed to minimize the contamination of powder and compact with gaseous constituents known to be harmful to resultant properties. An analysis of existing published investigations of current processing techniques, most notably those involving hot isostatic pressing (HIP), reveals that relative densities of 98-100% can only be obtained at processing temperatures in excess of 800-C. For such methods, and temperatures below 400-C, the relative densities achievable are typically of the order of 77%, when starting with an initial 'tape' density of 63%. In this context, the project goals, of reducing the processing temperature of PA powder compaction below 400-C while achieving a relative density above 98%, are to be seen as quite challenging. The novelty of the approach arises from the notion that severe shear deformation could prove an important factor for improving consolidation at relatively low processing temperatures. It has been shown that the use of ECAE with back pressure at 400-C permits production of compacts with relative densities in the range 98.3-98.6% and green strengths up to 750 MPa. The improvements in density and green strength are attributed to enhancement of self-diffusion rates at low temperatures that are in turn the result of an excess of structural defects created

during severe shear deformation and the effects of imposed hydrostatic pressure (back pressure).

DTIC

*Billets; Extruding; Metal Powder; Shear Properties; Titanium Alloys*

**20080001672** Office of the Under Secretary of Defense (Acquisitions and Technology), Washington, DC USA

**Corrosion Prevention and Control Planning Guidebook**

Dec 2003; 74 pp.; In English

Report No.(s): AD-A473147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473147>

The purpose of this document is to provide acquisition program managers with guidance in developing and implementing a Corrosion Prevention and Control Program for DoD weapon systems and infrastructure, and corrosion related technical aspects that should be addressed for a viable design. This guidance is in accordance with DoD Corrosion Prevention and Control Policy Letter, signed by Acting USD (AT&L) and dated Nov 12, 2003 (Appendix A). Corrosion is a long term issue that usually impacts system operation some time after the system is procured, but the best time to effectively combat the effect of corrosion is early in system development. There is a false common belief that corrosion prevention and mitigation can be reverse engineered into the system later in the operational life cycle. The fact is that corrosion can have a significant impact on operational readiness and safety both by itself and in conjunction with other damage phenomena, and its interactions with these factors should be considered during the conceptual design phase. This document establishes the requirements for materials, processes, techniques, and tasks required to integrate an effective corrosion prevention and control program during all phases of DoD weapon systems and infrastructure development. The intent is to minimize the impact of corrosion on life cycle cost, readiness, reliability, supportability, safety and structural integrity. This document provides tools and techniques for implementing sound materials/processes selection practices and finish treatments during all phases of DoD weapon systems and infrastructure development.

DTIC

*Corrosion Prevention; Design Analysis; Handbooks; Procurement*

**20080002284** Case Western Reserve Univ., Cleveland, OH, USA

**Partial Thermodynamic Properties of  $\gamma'$ -(Ni,Pt)<sub>3</sub>Al in the Ni-Al-Pt System**

Copland, Evan; [2006]; 25 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): GSN-8814; WBS 22-414-30-0443-01; No Copyright; Avail.: Other Sources

A series of measurements were made to determine how Pt influences the partial thermodynamic properties of Al and Ni in  $\gamma'$ -(Ni,Pt)<sub>3</sub>Al and liquid in the Ni-Al-Pt system. The activities of Al and Ni were measured by the vapor pressure technique with a multiple effusion-cell vapor source coupled to a mass spectrometer (multi-cell KEMS). For a consistent  $X(\text{sub Al}) = 0.24$ , adding Pt, from  $X(\text{sub Pt}) = 0.02$  to 0.25, reduces  $\alpha(\text{Al})$  almost an order of magnitude, from about  $2 \times 10(\text{exp } -4)$  to  $2 \times 10(\text{exp } -5)$ , at 1560K. This occurred with a consistent  $\Delta(\text{sub m})\bar{H}(\text{Al})$  of  $-203 \pm 10 \text{ kJmol}(\text{exp } -1)$  and the decrease in  $\alpha(\text{Al})$  was due to an increase in  $\Delta(\text{sub m})\bar{S}(\text{Al})$ , from .60 to .40  $\text{Jmol}(\text{exp } -1)/\text{K}$  with a decrease in the Ni/Pt ratio. The large negative  $\Delta(\text{sub m})\bar{H}(\text{Al})$  and  $\Delta(\text{sub m})\bar{S}(\text{Al})$  indicate Al-atoms are ordered in  $\gamma'$ -(Ni,Pt)<sub>3</sub>Al. Nickel measurements showed  $\alpha(\text{Ni})$  remains essentially constant, approximately 0.7, indicating an increasing ternary interaction between Ni-atoms and (Al + Pt)-atoms in  $\gamma'$ -(Ni,Pt)<sub>3</sub>Al with Pt addition, where  $\gamma(\text{sub Ni})$  increased from about 0.7 to 1.2. This is supported by  $\Delta(\text{sub m})\bar{H}(\text{Ni})$  in the range 6.1 to  $7.1 \pm 1.5 \text{ kJmol}(\text{exp } -1)$  at 1520K, and a positive  $\Delta(\text{sub m})\bar{S}(\text{sup xs})(\text{Ni})$  and suggests disorder on the Ni-lattice. For a consistent  $X(\text{sub Al}) = 0.27$ , adding Pt, from  $X(\text{sub Pt}) = 0.10$  to 0.25, also reduces  $\alpha(\text{Al})$  but only by a factor of about 3, while  $\alpha(\text{Ni})$  remained essentially constant, with  $\gamma(\text{sub Ni})$  increasing from about 0.7 to 0.95. A dramatic change in the mixing behavior was observed between the  $X(\text{sub Al}) = 0.24$  and 0.27 (hypo- and hyper-stoichiometric) series of alloys, where  $\Delta(\text{sub m})\bar{H}(\text{Al})$  and  $\Delta(\text{sub m})\bar{S}(\text{Al})$  are seen to increase about  $50 \text{ kJmol}(\text{exp } -1)$  and  $20 \text{ Jmol}(\text{exp } -1) \text{ K}(\text{exp } -1)$  at  $T = 1566\text{K}$ , respectively. In contrast,  $\Delta(\text{sub m})\bar{H}(\text{Ni})$  decreased about  $16 \text{ kJmol}^{-1}$  at  $T = 1520\text{K}$  and  $\Delta(\text{sub m})\bar{S}(\text{sup xs})(\text{Ni})$  changed from a positive to a negative value.

Author

*Thermodynamic Properties; Aluminum Alloys; Platinum Alloys; Nickel Alloys*

**20080002544** Explosives Research and Development Establishment, Waltham Abbey, UK

**Parallel Plate Plastometry of Plastic Propellant. Part 2. Determination of Plastoviscosity and the Flow Curve Equation**

Gledhill, Virginia M; Dukes, W A; Jan 1972; 43 pp.; In English

Report No.(s): AD-A473686; ERDE-TR-87; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The use of the parallel-plate plastometer has been extended to measure the plastoviscosity of a representative plastic

propellant over a wide strain-rate range (about  $10(\text{exp } -5)$  to  $10 \text{ s }^{-1}$ ). The experimental technique is to compress a cylindrical specimen but the results can be analyzed in two ways, yielding either zero-strain or finite-strain plastoviscosities respectively. Both plastoviscosities are, within experimental scatter, inversely proportional to the square root of the strain-rate, and range from about 100 to 0.1 MN s/m squared (1 GP to 1 MP). The plastoviscosity decreases rapidly and exponentially with increasing strain. When the finite-strain measurements are extrapolated to zero strain, there is good agreement with the zero-strain measurements. The flow curve for a given strain, relating strain-rate with stress, is parabolic. The yield stress and shear-hardening coefficient (measured separately) have been taken into account, resulting in a complete flow equation linking stress, strain and strain-rate, corresponding to a family of flow curves.

DTIC

*Flow Equations; Parallel Plates; Plastic Propellants; Plastics; Propellants*

**20080002571** Office of the Under Secretary of Defense (Acquisitions and Technology), Washington, DC USA

**Corrosion Prevention and Control Planning Guidebook Spiral 3**

Sep 2007; 308 pp.; In English

Report No.(s): AD-A473723; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document provides program and project managers with guidance for developing and implementing a corrosion prevention and control program for DoD weapon systems and infrastructure. It includes corrosion-related policy; management planning; and technical and design considerations that should be addressed for a viable design. This guidance is in accordance with the DoD Corrosion Prevention and Control policy letter, signed by the Acting Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]), 12 November 2003 (see Attachment 1), and the Facility Corrosion Prevention and Control memorandum, signed by the Deputy Under Secretary of Defense for Installations and Environment, 10 March 2005 (Appendix F to Volume III). Program and project managers perhaps more than any other group greatly influence DoD's corrosion-related cost, safety, and reliability impacts during the acquisition of systems and infrastructure. That is why Volumes I and III of the Corrosion Prevention and Control Planning Guidebook are targeted to them. The volumes identify the materials, processes, techniques, and tasks required to develop and integrate an effective corrosion prevention and control program during all phases of DoD weapon system and infrastructure development. The objective is to minimize the effects of corrosion on life-cycle costs, readiness, reliability, supportability, safety, and structural integrity. Volume II of this guidebook focuses on equipment sustainment and includes information on life-cycle logistics and the development of sustainment corrosion programs for weapon systems. Following the guidance in this document in conjunction with applicable program and technical documentation will result in the best possible balance between acquisition and life-cycle costs for DoD systems.

DTIC

*Corrosion Prevention; Handbooks; Management Planning; Weapon Systems*

**20080002629** SRI International Corp., Menlo Park, CA USA

**Accurate Evaluation of Nonlinear Absorption Coefficients in InAs, InSb and Hg<sub>1-x</sub>Cd<sub>x</sub>Te Alloys (Postprint)**

Guha, Shekhar; Yu, Zhi G; Krishnamurthy, Srinivasan; Gonzales, Leonel P; Jun 6, 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473809; AFRL-ML-WP-TP-2007-504; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present a full band structure calculation of temperature- and wavelength-dependent two-photon absorption (TPA) coefficients and free carrier absorption (FCA) cross sections in InAs, InSb, and Hg<sub>1-x</sub>Cd<sub>x</sub>Te alloys. Although the wavelength dependence of the TPA coefficients agrees well with Wherrett expression, the accurately calculated values are smaller by a factor of 1.2 to 2.5. In addition, the TPA coefficient depends sensitively on the photoexcited carrier density in small gap material. The FCA is dominated by holes. The FCA cross section is independent of carrier density, but is strongly dependent on temperature. The calculated coefficients and lifetimes are fitted to closed form expressions and used in solving the rate equation to obtain the transmitted pump and probe intensities as functions of incident intensity and sample thickness. The calculated pump transmission and time-dependent probe transmission in InAs agree very well with the measured values.

DTIC

*Absorptivity; Alloys; Boron Alloys; Indium Arsenides; Nonlinear Systems; Nonlinearity; Photons; Tellurium Alloys*

**20080002809** Defence Science and Technology Organisation, Victoria, Australia

**Restrictions on the Ratio of Normal to Tangential Field Components in Magnetic Rubber Testing**

Burke, S K; Ibrahim, M E; Jul 2007; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473783; DSTO-TR-1991; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Magnetic Rubber Testing (MRT) is an extremely sensitive method for detecting surface-breaking cracks in ferromagnetic materials, and is used extensively in critical inspections for D6ac steel components of the F-111 aircraft. This report documents a series of experiments, performed to investigate the effect of normal versus tangential magnetic field components in MRT. The results confirm that excessive levels of normal (perpendicular) magnetic field in active-field MRT procedures can cause distortion, weakening or masking of indications from fatigue cracks. Consequently, recommendations are made for the restriction of normal field levels in the development of active-field MRT procedures. This work does not deal with residual-field MRT, and the supplied herein are not transferable to residual-field measurements.

DTIC

*Crack Propagation; Ferromagnetic Materials; Magnetic Materials; Rubber*

**27**

**NONMETALLIC MATERIALS**

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

**20080000373** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Field Demonstration of Bio-based Hydraulic Fluids for Military Construction Equipment**

Rhee, In-Sik; Bailey, Camela A; May 24, 2007; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472165; TARDEC-17084; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472165>

Outline: Background; Federal Biobased Products Preferred Procurement Program; New Biodegradable/Biobased Hydraulic Fluid Specification; Field Demonstration, Final Results; Conclusions.

DTIC

*Biodegradability; Construction; Hydraulic Fluids*

**20080000966** Hokkaido Univ., Sapporo, Japan

**Nano-SMA Fiber Composites Development and Applications**

Kato, H; Tamagawa, H; Jul 27, 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA48690610079

Report No.(s): AD-A472570; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472570>

We design a set of self-strengthening AMCs with shape memory nanofibers with the aim of inducing compressive stress at different use temperatures; (i) high temperature for leading edge structure panels or those near engine and (ii) low temperatures for composite face sheets of AF cryogenic tanks. To this end, two types of SM nanofibers will be used, shape memory alloy (SMA) and shape memory polymer (SMP). SMA exhibit phase change at transformation temperatures (Ms, Mf, As, Af) while SMP exhibits a similar phase change at Tg. This project is aimed at creating a set of new designs of autonomic multi-functional composites (AMCs) by interacting with different disciplines - Polymer Chemistry, Materials Science and Engineering, and Mechanical Engineering at the University of Washington (UW) and Hokkaido University (HU). The UW-HU team proposes to design self-strengthening AMCs for use in the composite structures in high and low temperature environments. The key active and sensing material in designing the proposed AMCs is shape memory (SM) nanofibers where SM can be shape memory alloy (SMA) or shape memory polymer (SMP). SMA and SMP nano-fiber will be used for self-strengthening AMCs in high temperature (temperature change), or in low temperature. The key concept in designing self-strengthening AMCs is to induce compressive stress in the matrix material through a shape (or length) change in SM nanofibers upon temperature change. This compressive stress in the matrix is expected to suppress any cracking in the matrix. Use of ferromagnetic SMA FePd nano-fibers is expected to provide additional functionality to the self-strengthening AMC, i.e. (i) self-diagnosis if the composite is inspected by magneto-optic-image scanner and (ii) stealth under radar detection.

DTIC

*Fiber Composites; Shape Memory Alloys*

**20080001015** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Apr 12, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472662; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472662>

Petroleum prices have risen sharply since early 2004. At the same time the average amount of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and could add about \$100 billion in 2006, depending on how sustainable is the rate of recent price increases. This report provides an estimate of the initial impact of the rising oil prices on the nation's merchandise trade deficit. This report will be updated as warranted by events.

DTIC

*Costs; Oils; Petroleum Products*

**20080001038** Army Research Lab., Aberdeen Proving Ground, MD USA

**Directed Assembly of Quantum Dots in Diblock Copolymer Matrix**

Beyer, Frederick L; Ziegler, Christopher R; Sill, Kevin; Emrick, Todd; Benetatos, Nicholas M; Winey, Karen I; Aug 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DMR-0549116; DEFG02-91ER45439; Proj-AH-42

Report No.(s): AD-A472709; ARL-TR-4204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472709>

The effect of ligand molecular weight on nanoparticle dispersion and nanocomposite morphology has been investigated. Nanoscopic particles, CdSe/ZnS quantum dots (QDs), were dispersed into the polystyrene (PS) microdomains of a microphase separated, bulk PS-poly(methyl methacrylate) block copolymer. The QDs were compatibilized with the PS-domains of the microphase separated block copolymer by the use of PS-based ligands associated with the surfaces of the QDs. A stock solution of the functionalized particles was mixed with dissolved block copolymer, and bulk samples were formed by solvent evaporation. Dispersion of the nanoparticles was determined via bright field transmission electron microscopy and high-angle annular dark field scanning transmission electron microscopy. The microphase separated block copolymer morphology (lamellae) was probed using small-angle and ultrasmall-angle x-ray scattering. Although the additive particles are much larger in diameter than those considered in previous calculations and experimental work, it was found that the QDs modified with 14,000 g/mol PS ligands dispersed well in the block copolymer, while those modified with 81,000 g/mol PS ligands formed small aggregates. In these nanoparticle/polymer composites, the block copolymer retains its original morphology.

DTIC

*Block Copolymers; Copolymers; Molecular Weight; Polystyrene; Quantum Dots; X Ray Scattering*

**20080001053** Army Research Lab., Aberdeen Proving Ground, MD USA

**Advanced Fast Curing Adhesives for Adverse Conditions**

De Bonis, Daniel; La Scala, John; Jul 2007; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-78M434

Report No.(s): AD-A472743; ARL-RP-183; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472743>

Numerous adhesives are available which provide fast, strong and durable bonding on a variety of substrates. There are however, no current adhesives which meet all these criteria when used in wet or underwater applications. Existing adhesive technology falls short of current military field requirements which often require adhesive applications be made successfully in seconds, not minutes, in cold wet environments. Research is being carried out to develop faster, low temperature curing, aquatic capable adhesives with properties equal to existing dry application formulations. A large variety of commercial adhesive formulations were characterized to determine their applicability for potential modification and use. Additives and modifiers were developed to create adhesives that quickly form strong bonds between water saturated surfaces and cure sufficiently in the presence of water. The approach to modification includes novel experimentation as well as integration of traditional adhesive chemistry in non-traditional ways.

DTIC

*Adhesives; Conditions; Curing; Hazards*

**20080001196** Colorado Univ., Boulder, CO USA

**Unusual Nature of NanoDomains in Ultrahigh Temperature Polymer Derived Ceramics**

Raj, Rishi; Sep 25, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0154

Report No.(s): AD-A472933; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This grant has the objective of explaining the unusual properties of polymer-derived-ceramics (PDCs), so called because they are made directly from cross-linked polymers by controlled pyrolysis. The PDCs have unusual properties: (i) They remain structurally and chemically stable up to 1500 degrees C, (ii) They are amorphous in Bragg diffraction although small-angle-x ray-scattering shows the presence of nanodomains, (iii) PDCs do NOT show steady state creep despite their amorphous structure, and (iv) PDCs exhibit viscoelasticity at high temperatures. The critical advance made in this grant is the development of a nanodomain model for the PDCs, which is validated by the experimental findings. The model consists of a graphene network interconnected in the form of nanodomains, about 1-5 nm in size. The graphene network stabilizes the amorphous structure of the ceramic. The unusual properties of PDCs are successfully explained by the nanodomain model. The PDCs are a new class of metastable ceramics that are likely to lead to revolutionary new technologies for high temperatures. Their amorphous nature is similar to that of polymers and metallic glasses. However, the chemical and structural stability of the PDCs at ultrahigh temperatures is unique.

DTIC

*Amorphous Materials; Ceramics; X Ray Scattering*

**20080001201** Army Engineer Research and Development Center, Vicksburg, MS USA

**Laboratory Characterization of Solid Grade SW Brick**

Williams, Erin M; Akers, Stephen A; Reed, Paul A; Aug 2007; 88 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472942; ERDC/GSL-TR-07-24; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Personnel of the Geotechnical and Structures Laboratory, U.S. Army Engineer Research and Development Center, conducted a laboratory investigation to characterize the strength and constitutive property behavior of solid Grade SW brick. A total of 37 mechanical property tests were successfully completed, consisting of two hydrostatic compression tests, four unconfined compression (UC) tests, 12 triaxial compression tests (TXC), two constant mean normal stress tests, four direct pull (DP) tests, two uniaxial strain tests, four uniaxial strain load/biaxial strain unload (UX/BX) tests, five uniaxial strain load/constant volume strain loading (UX/CV) tests, and two uniaxial strain load/constant strain path (UX/SP) tests. In addition to the mechanical property tests, nondestructive pulse-velocity measurements were performed on each specimen. Results from the TXC tests exhibited a continuous increase in principal stress difference with increasing confining stress. A compression failure surface was developed from the TXC results at six levels of confining pressure and from the results of the UC tests. The results for the DP tests were used to evaluate the tensile strength of the brick. During UX/BX tests, stress relaxation was evident during the change from uniaxial strain loading to biaxial strain unloading. Good correlations were observed between the stress paths obtained from the UX/BX, UX/CV, and UX/SP strain path tests and the failure surface developed from the TXC tests.

DTIC

*Bricks; Compression Tests*

**20080001204** Army Engineer Research and Development Center, Vicksburg, MS USA

**Laboratory Characterization of Gray Masonry Concrete**

Williams, Erin M; Akers, Stephen A; Reed, Paul A; Aug 2007; 99 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472947; ERDC/GSL-TR-07-23; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Personnel of the Geotechnical and Structures Laboratory, U.S. Army Engineer Research and Development Center, conducted a laboratory investigation to characterize the strength and constitutive property behavior of a gray masonry concrete. A total of 38 mechanical property tests were successfully completed: two hydrostatic compression tests, four unconfined compression (UC) tests, 16 triaxial compression (TXC) tests, two uniaxial strain tests, two uniaxial strain load/biaxial strain unload tests, five uniaxial strain load/constant volume strain loading (UX/CV) tests, two uniaxial strain load/constant strain ratio (UX/SR) tests, three direct pull tests, and two reduced triaxial extension tests. In addition to the mechanical property tests, nondestructive pulse-velocity measurements were performed on each specimen. The TXC tests exhibited a continuous increase in maximum principal stress difference with increasing confining stress. A compression failure surface was developed from the TXC test results at eight levels of confining stress and from the results of the UC tests. The results of the direct pull and reduced triaxial extension tests were used to develop the extension failure surface. The resulting compression and extension failure surfaces were well defined and nonsymmetric about the mean normal stress axis. Good

correlations were observed between the stress paths obtained from the UX/CV and UX/SR strain path tests and the failure surface from the TXC test.

DTIC

*Compression Tests; Concretes; Masonry*

**20080001207** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Field Demonstration of Biobased Fluids in Military Construction Equipment**

Rhee, In-Sik; Das, Henna; Weimer, Todd P; Cordell, Jeffery; Jul 2007; 35 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A472952; TARDEC-TR-17682; No Copyright; Avail.: Defense Technical Information Center (DTIC)

TARDEC has initiated a joint field demonstration program with US Department of Agricultural (USDA) and PM of Combat Engineer/ Materiel Handling Equipment to evaluate biobased hydraulic fluids in military construction hydraulic systems. The objective of this program is to introduce the environmentally acceptable hydraulic fluids into military hydraulic systems. Five biobased fluids qualified under MILPRF-32073 specification were tested in ten pieces of military construction equipment at Fort Leonard Wood, MO for a year. The test results showed that biobased fluids tested did not show any abnormal behavior in this demonstration and provided acceptable performance comparable to the existing petroleum based fluids. In addition, no equipment failed or was damaged due to the biobased fluids. Therefore, the biobased fluids can be used as an operational fluid for the hydraulic systems of military construction equipments.

DTIC

*Biodegradation; Construction; Hydraulic Fluids; Military Technology*

**20080001634** Ogata Research Lab., Hokkaido, Japan

**High Density Data Storage Systems by DNA Complexes and Nano-Particles from DNA Hybrid Materials**

Ogata, Naoya; Dec 20, 2006; 26 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0064

Report No.(s): AD-A473094; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473094>

The work focused on: (1) syntheses and characterization of Novel DNA-lipid films derived from alanine, (2) In-situ Intercalation of Phtharocyanine dye (PC) into DNA and Polyamine Complex, (3) syntheses and characterization of Nano-particles derived from DNA-polymer Hybrid Materials Containing Optical Dyes, and (4) demonstration of high density data storage system using DNA complex.

DTIC

*Computer Storage Devices; Data Storage; Deoxyribonucleic Acid; Nanoparticles; Photonics; Polymers*

**20080001636** Pohang Univ. of Science and Technology, Pohang, Korea, Republic of

**Nanocomposite Gate Dielectrics With Nanoparticles for Organic Thin Film Transistors**

Park, Chan E; Sep 15, 2006; 7 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0086

Report No.(s): AD-A473096; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473096>

To overcome conventional organic thin film transistors (OTFTs) associated with high operating voltage due to the low charge carrier mobility of organic semiconductors, this work implements high dielectric constant gate insulators for enhancing field-induced carrier density. For the high dielectric constant material, the work investigates nanocomposite films that consists of cross-linked poly-4-vinyl phenol (PVP) and (Ba,Sr)TiO<sub>3</sub> (Barium strontium titanate; BST).

DTIC

*Barium Titanates; Dielectrics; Nanocomposites; Nanoparticles; Polymeric Films; Semiconductors (Materials); Strontium Titanates; Thin Films; Transistors*

**20080001674** Cornerstone Research Group, Inc., Dayton, OH USA

**Shape Memory Polymer Self-Deploying Membrane Reflectors**

Vining, Stephen D; Jan 30, 2007; 102 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-2468; Proj-4056

Report No.(s): AD-A473150; CRG-AFRL2468-08PR; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473150>

CRG succeeded in developing self-deploying membrane reflector technology to readiness for transition to use in system

development by a major spacecraft prime contractor, Ball Aerospace & Technologies Corporation (BATC), and BATC commenced Phase 11 application of the technology. This excerpt of the project Final Report summarizes results Cornerstone Research Group Inc. (CRC) achieved under Air Force Research Laboratory (AFRL) contract FA8650-04-C-2468 for an Air Force Small Business Innovation Research (SBIR) Phase II project entitled, 'Shape Memory Polymer Self-Deploying Membrane Reflectors.' AFRL awarded this contract under Department of Defense (DoD) SBIR 2003.1 Topic AF03-182, 'Deployable, Membrane Optical or RF Reflector.' CRC conducted Phase I effort under Air Force Flight Test Center (AFFTC) contract F0461 1-03-M-3107. NOTE: This excerpt omits material presented by the official final report that is not suitable for public release. For traceability to the official report, altered text is identified by enclosure in brackets and original section and figure numbering are maintained by using '&quot;[Reserved]' to account for omissions that would otherwise alter the sequence.

DTIC

*Computer Storage Devices; Deployment; Membranes; Optical Equipment; Polymers; Reflectors; Self Erecting Devices; Shapes; Telecommunication*

**20080002152** Army Research Development and Engineering Command, Warren, MI USA

#### **Various Ceramics in Multilayer Composite Ground Vehicle Armor**

Rose, Douglas N; Bankowski, Elena; Clauson, Mike; Sep 17, 2007; 12 pp.; In English; Original contains color illustrations Report No.(s): AD-A473290; No Copyright; Avail.: Defense Technical Information Center (DTIC)

These briefing charts describe the use of various ceramics in multilayer composite ground vehicle armor. One material that is planned for pilot production is silicon nitride as a material solution for pellets in a pellet armor approach to ground vehicle armor. One of the pilot program's aims is cost reduction, from \$200/Kg to \$20/Kg. As described in filed patents, armor constructed of assembled ceramic pellets suspended in a matrix binder performs better at defeating the same weight of armor made from a monolithic tile of the same ceramic. The force dynamics are significantly different for the interaction of pellets versus isolated tiles. Potential applications for this material are in personal armor, satellites, light attack vessels, critical shipboard areas, and the Expeditionary Fighting Vehicle (EFV). Different types of ceramics have different costs, and ceramics made by different processes have distinctly different strengths and weaknesses. The charts include the names and descriptions of three major ceramic insert manufacturers and four major ceramic armor assemblers/finishers. The final chart presents photographs of potential applications for very light armors.

DTIC

*Armor; Ceramic Matrix Composites; Ceramics; Composite Materials; Military Vehicles; Pellets; Silicon Nitrides*

**20080002280** NASA Glenn Research Center, Cleveland, OH, USA

#### **Flexible, Low-Density Polymer Crosslinked Silica Aerogels**

Capadona, Lynn A.; Meador, Mary Ann B.; Alunni, Antonella; Fabrizio, Eve F.; Vassilaras, Plousia; Leventis, Nicholas; [2005]; 13 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-612-50-04-22; No Copyright; Avail.: Other Sources

Polymerization of a di-isocyanate with the amine-modified surface of a sol-gel derived mesoporous silica network crosslinks the nanoparticles of the silica skeleton, and reinforces the otherwise fragile framework. Systematically adjusting the processing variables affecting density produces aerogels whose macroscopic properties could be controlled, and are attributed to changing nanoscale morphology. Aerogels crosslinked using the smallest amount of silica studied exhibit as much as a forty-fold increase in strength over the corresponding non-crosslinked framework, and are flexible.

Author

*Aerogels; Polymerization; Silicon Dioxide; Sol-Gel Processes*

**20080002363** Dayton Univ. Research Inst., OH USA

#### **Tensile Failure Prediction and Measurement in Composite Scarf Repair (Preprint)**

Iarve, Endel V; Breitzman, Timothy D; Cook, Benjamin M; Schoepfner, Gregory A; Mollenhauer, David H; May 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0142; FA8650-05-D-5052; Proj-4347

Report No.(s): AD-A473524; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473524>

Oversized quasi-isotropic tensile specimens were manufactured from IM6/3501-6 graphite/epoxy prepreg. Seven specimens were scarfed in the center of the panel, and four of the panels were subsequently repaired. The repair patch consisted of a ply-by-ply replacement of the removed material with a FM-300M095 film adhesive placed between the repair



patch and the scarfed specimen. The patch and adhesive were then co-cured. The repaired and unrepaired specimens were strain gaged and tested to failure. A three-dimensional failure analysis was performed. The strength prediction was based on the state of stress in the 0(exp 0) plies by taking into account the redistribution of stress due to adhesive failure. The performed analysis accurately predicted both the strength of the scarfed and repaired panels based solely on properties characterized by testing unnotched standard coupons.

DTIC

*Composite Materials; Failure Analysis; Predictions; Scarf Joints; Scarfing; Tensile Strength*

**20080002443** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Negative Thermal Expansion In Ultrathin Plasma Polymerized Films (Preprint)**

Bunning, Timothy J; Jiang, Hao; Singamaneni, Srikanth; Tsukruk, Vladimir V; LeMieux, Melburne C; Mar 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473666; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473666>

Owing to the increasing applications of polymer films with nanoscale thickness, it is imperative to fully characterize the physical properties in these films, which could be significantly different from the bulk properties due to the surface and interfacial effects. Interactions with the substrate and high specific surface area (film/ air and film/ substrate) can cause peculiar properties of the ultrathin polymer films. In a recent study the glass transition of a free standing and supported PS film was found to vary significantly with thickness. Other studies have unveiled several interesting phenomena such as the depth dependent glass transition temperature and thickness dependent thermal expansion. It has been reported that substrate interactions alter the thermal properties of ultrathin poly-(2)-vinylpyridine films. A non monotonic thermal behavior was observed in ultrathin polycarbonate films with a negative and positive thermal expansion below and above glass transition temperature, respectively.

DTIC

*Plasmas (Physics); Polycarbonates; Polymeric Films; Polymerization; Thermal Expansion; Thermodynamic Properties; Thin Films*

**20080002445** Library of Congress, Washington, DC USA

**Iraq: Oil and Gas Legislation, Revenue Sharing, and U.S. Policy**

Blanchard, Christopher M; Oct 2, 2007; 27 pp.; In English

Report No.(s): AD-A473668; CRS-RL-34064; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473668>

Iraqi leaders continue to debate a package of hydrocarbon sector and revenue sharing legislation that would define the terms for the future management and development of the country's significant oil and natural gas resources. The package includes an oil and gas sector framework law and three supporting laws that would outline revenue sharing, restructure Iraq's Ministry of Oil, and create an Iraqi National Oil Company. Both the Bush Administration and Congress consider the passage of oil and gas sector framework and revenue sharing legislation as important benchmarks that would indicate the current Iraqi government's commitment to promoting political reconciliation and long term economic development in Iraq.

DTIC

*Gases; International Relations; Law (Jurisprudence); Oils; Policies; Revenue*

**20080002569** Army Tank-Automotive and Armaments Command, Warren, MI USA

**Evaluation of Biobased Hydraulic Fluids in Military Construction Equipment**

Rhee, In-Sik; Oct 31, 2007; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473720; No Copyright; Avail.: Defense Technical Information Center (DTIC)

U.S. Army Tank-Automotive RD&E Center is currently developing biobased hydraulic fluids (BHF's) to replace military industrial and mobility hydraulic fluids that are incompatible with environment. To verify the performances of these biobased fluids in military construction equipments, a joint field demonstration was initiated with US Department of Agricultural (USDA) using ten military construction equipment (i.e., Bulldozer, Scraper, Grader, Loader, Crane, etc.) at Fort Leonard Wood, MO. The field test was successfully completed and the test results showed that BHF's did not provide any abnormal

behavior compared to the conventional petroleum based fluids. Based on the test results, this paper will discuss the on-going biobased fluid evaluation program, test results, and findings.

DTIC

*Construction; Hydraulic Fluids; Oils; Vegetables*

**20080002589** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Synthesis and Near-Infrared Luminescence of a Deuterated Conjugated Porphyrin Dimer for Probing the Mechanism of Non-Radiative Deactivation (Postprint)**

Rogers, Joy E; Fleitz, Paul A; Frampton, Michael J; Anderson, Harry L; Accorsi, Gianluca; Armaroli, Nicola; McEwan, Kenneth J; Feb 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473750; AFRL-ML-WP-TP-2007-488; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Beta-meso-beta-Fused porphyrin oligomers have many attractive photophysical features such as strong absorption in the near-IR at wavelengths greater than 1000 nm, and high two-photon cross sections. However their ultrafast S(sub-1)-S(sub-0) deactivation limits potential applications. We have synthesised a deuterated fused porphyrin dimer to test whether deuteration influences the rate of non-radiative deactivation. An efficient synthetic strategy was developed, starting with deuteration of dipyrromethane. Deuteration of the zinc porphyrin dimer does not affect its fluorescence quantum yield in CD<sub>2</sub>Cl<sub>2</sub>. This implies that the ultrafast non-radiative deactivation is not simply a consequence of the small S(sub-1)-S(sub-0) energy gaps to the beta-meso-beta-fused porphyrin oligomers but with slower rates of S(sub-1)-S(sub-0) decay.

DTIC

*Conjugation; Deactivation; Deuterium Compounds; Dimers; Light Emitting Diodes; Luminescence; Near Infrared Radiation; Porphyrins*

**20080002592** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Morphological Studies of Bragg Reflection Gratings Written in Holographic Polymer Dispersed Liquid Crystals by Thiol-Ene Photopolymerization (Preprint)**

Bunning, Timothy J; Wofford, Jeremy M; Natarajan, L V; Sutherland, R L; Tondiglia, Vincent; Lloyd, Pamela; Aug 2007; 5 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473754; AFRL-ML-WP-TP-2007-507; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recently, a new photopolymerization system for writing visible light initiated thiol-ene based H-PDLC Bragg reflection gratings was developed. Using this new method, Bragg reflection gratings were written with notch wavelengths out into the NIR. The aim of the present work is to determine the grating parameters like spacing, LC width, polymer width and droplet density from morphological studies and compare with those obtained from optical measurements. The electro-optical performance of the gratings is also interpreted in terms of the morphology. The morphological properties of these gratings were obtained from TEM and cryo-SEM microscopy. The spacing, LC droplet sizes and droplet densities correlate very well with the optical and electro-optical performance of the gratings.

DTIC

*Bragg Gratings; Holography; Liquid Crystals; Morphology; Photopolymers; Polymerization; Thiols*

**20080002810** Concurrent Technologies Corp., Johnstown, PA USA

**Final Joint Test Protocol JP-P-1-1 for Validation of Alternatives to Lead-Containing Dry Film Lubricants for Antigalling/Antifretting, Antiseizing, and Assembly Aid Applications**

Thomstatter, John; Sep 29, 2004; 96 pp.; In English

Contract(s)/Grant(s): DAAE30-98-C-1050

Report No.(s): AD-A473657; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473657>

This revision to the Joint Test Report for Validation of Alternatives to Lead-Containing Dry Film Lubricants for Antigalling/Antifretting, Antiseizing, and Assembly Aid Applications includes an additional test requirement for humidity resistance. This requirement was identified by turbine engine original equipment manufacturers based on experience in evaluating water-based dry film lubricants (DFLs) for antigalling/antifretting applications. Exposure of some DFLs to hot,

humid conditions has the potential to rehydrate the binder, rendering the DFL as a 'wet' coating that is susceptible to removal. This report was prepared by the NDCEE. This report was prepared on behalf of, and under guidance provided by the Propulsion Environmental Working Group (PEWG) and the Joint Group on Pollution Prevention (JG-PP). The structure, format, and depth of technical content of the report were determined by the JG-PP Working Group, PEWG, original equipment manufacturers, and other Government technical representatives in response to the specific needs of this project.

DTIC

*Alternatives; Drying; Hydration; Lubricants; Protocol (Computers); Solid Lubricants*

## 28

### PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 *Nuclear Physics*. For related information see also 07 *Aircraft Propulsion and Power*; 20 *Spacecraft Propulsion and Power*; and 44 *Energy Production and Conversion*.

**20080000368** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Single Battlefield Fuels (SBF) Made From Unconventional Resources. Material Issues - An Army Perspective**

Muzzell, Patsy A; Apr 25, 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472160; TARDEC-17078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472160>

Department of Defense(DoD) key fuels and their specifications.

DTIC

*Fuels; Mixtures*

**20080000377** Defense Energy Support Center, Fort Belvoir, VA USA

**Defense Energy Support Center Fact Book, Fiscal Year 1999, Twenty-Second Edition**

Jan 1999; 70 pp.; In English

Report No.(s): AD-A472175; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472175>

The Defense Energy Support Center Fact Book contains statistical information regarding the Center's business operation. The Fact Book reflects the Center's operational status at the end of FY 99 unless otherwise indicated. The publication is intended to be used for general information purposes only and is not to be considered a source for official communications. We hope you will find it useful.

DTIC

*Defense Program; Petroleum Products; Supplying*

**20080000378** Defense Energy Support Center, Fort Belvoir, VA USA

**Defense Energy Support Center Fact Book, Fiscal Year 2000, Twenty-Third Edition**

Jan 2000; 72 pp.; In English

Report No.(s): AD-A472176; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472176>

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DTIC

*Defense Program; Petroleum Products; Supplying*

**20080000379** Defense Energy Support Center, Fort Belvoir, VA USA

**Defense Energy Support Center Fact Book, Fiscal Year 2001, Twenty-Fourth Edition**

Jan 2001; 78 pp.; In English

Report No.(s): AD-A472177; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472177>

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DTIC

*Defense Program; Petroleum Products; Supplying*

**20080000380** Defense Energy Support Center, Fort Belvoir, VA USA

**Defense Energy Support Center Fact Book, Fiscal Year 2002, Twenty-Fifth Edition**

Jan 2002; 94 pp.; In English

Report No.(s): AD-A472178; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472178>

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DTIC

*Defense Program; Petroleum Products; Supplying*

**20080000387** Defense Energy Support Center, Fort Belvoir, VA USA

**DESC - Providing Energy to Train, to Fight to Win. Defense Energy Support Center Fact Book, Fiscal Year 2006, Twenty-Ninth Edition**

Mar 14, 2007; 100 pp.; In English

Report No.(s): AD-A472198; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472198>

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DTIC

*Defense Program; Petroleum Products; Supplying*

**20080000388** Defense Energy Support Center, Fort Belvoir, VA USA

**Energy Support for Global Missions. Defense Energy Support Center Fact Book, Fiscal Year 2003, Twenty-Sixth Edition**

Jan 2003; 103 pp.; In English

Report No.(s): AD-A472199; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472199>

The Defense Energy Support Center Fact Book contains statistical information regarding the Center's business operations. The Fact Book reflects the Center's operational status at the end of fiscal year 2003 unless otherwise indicated. The intent is for the use of this publication as a source for general information purposes only. The Fact Book is not to be considered a source for official communications. We hope you will find it useful.

DTIC

*Defense Program; Petroleum Products; Supplying*

**20080000389** Defense Energy Support Center, Fort Belvoir, VA USA

**First Choice for Energy Support. Defense Energy Support Center Fact Book, Fiscal Year 2004, Twenty-Seventh Edition**

Jan 2004; 106 pp.; In English

Report No.(s): AD-A472200; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472200>

The Defense Energy Support Center Fact Book contains statistical information regarding the Center's business operations. The Fact Book reflects the Center's operational status at the end of fiscal year 2004 unless otherwise indicated. The intent is

for the use of this publication as a source for general information purposes only. The Fact Book is not to be considered a source for official communications. We hope you will find it useful.

DTIC

*Defense Program; Petroleum Products; Selection; Supplying*

**2008000390** Defense Energy Support Center, Fort Belvoir, VA USA

**Supporting Worldwide Missions with DESC Energy Around the Globe. Defense Energy Support Center Fact Book, Fiscal Year 2005, Twenty-Eighth Edition**

Jan 2005; 105 pp.; In English

Report No.(s): AD-A472201; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472201>

The Defense Energy Support Center Fact Book contains statistical information regarding the Center's business operations. The Fact Book reflects the Center's operational status at the end of fiscal year 2005 unless otherwise indicated. The intent is for the use of this publication as a source for general information purposes only. The Fact Book is not to be considered a source for official communications. We hope you will find it useful. The Fact Book can also be found on-line at [www.desc.dla.mil](http://www.desc.dla.mil) in the Publications sections of the web page.

DTIC

*Defense Program; Petroleum Products; Supplying*

**20080001159** Library of Congress, Washington, DC USA

**The Gas to Liquids Industry and Natural Gas Markets**

Pirog, Robert; Nov 8, 2004; 13 pp.; In English

Report No.(s): AD-A472821; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Technological improvements and investment commitments from the world's largest oil companies suggest the gas to liquids (GTL) industry is likely to expand rapidly over the next decade. GTL uses large quantities of natural gas to produce liquid petroleum products like diesel fuel and home heating fuel. The GTL industry might become an important competitor to the liquefied natural gas industry (LNG) in the effort to secure natural gas supplies. As a result, LNG markets may be tighter, with higher prices, potentially altering LNG's projected role in the U.S. natural gas market.

DTIC

*Industries; Liquefied Natural Gas; Liquids; Market Research; Natural Gas*

**20080001205** Army War Coll., Carlisle Barracks, PA USA

**Turkmenistan and Central Asia after Niyazov**

Blank, Stephen J; Sep 2007; 100 pp.; In English

Report No.(s): AD-A472948; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Sapirmurat Niyazov ruled Turkmenistan, a small Central Asian country with enormous natural gas holdings, like a sultan or latter-day Stalin. Therefore, his sudden death on December 21, 2006, opened the way not just to a domestic power struggle, but also to fears of instability in Turkmenistan and Central Asia, and to a major international struggle among the great powers -- Russia, China, Iran, and the USA -- for influence over the new leadership. This monograph examines the dimensions of the succession to Niyazov, the great power struggle for influence in this key Central Asian state, and concludes with recommendations for American policy makers. It examines the ways in which the succession has been arranged and what its likely course is going to be, one of very cautious and moderated reforms from the top. It also takes account of the issue of succession in Central Asian regimes, all of which are despotic and often dominated by families and clans. Turkmenistan may serve as a kind of precedent of what we should soon expect elsewhere in Central Asia, given the age of its leaderships. In similar fashion, this monograph examines in detail Niyazov's energy policies and the rivalry among the key players -- Russia, Iran, China, and America -- for influence over the future disposition of those holdings and the destination of future pipeline projects. This great power rivalry also encompasses Russian and Iranian, if not Chinese, efforts to persuade Turkmenistan to renounce in deed or in rhetoric the neutrality that was Niyazov's consistent policy and join one or another of the regional security blocs that they are proposing. Washington is seeking to ensure that Turkmenistan's gas goes to states and markets other than exclusively to Russia and supports new pipelines like those to China, a projected pipeline to India through Afghanistan and Pakistan, and a Trans-Caspian pipeline to Azerbaijan. The author also makes specific recommendations to American policy makers.

DTIC

*Asia; Competition; International Relations; Leadership; Natural Gas; Policies; Security; Turkmenistan*

**20080001657** ABB Environmental Services, Inc., Portland, ME USA  
**Remedial Investigation Report Area of Contamination (AOC) 43J. Volume 1 of 2**

Feb 1996; 478 pp.; In English

Contract(s)/Grant(s): DAAA-91-D-0008

Report No.(s): AD-A473126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473126>

ABB Environmental Services, Inc. (ABB-ES) has prepared this Remedial Investigation (RI) Report on Area of Contamination (AOC) 43J, the former waste oil and historic gas station gasoline underground storage tank (UST) in the 10th Special Forces motor pool, at the Fort Devens U.S. Army Installation, Massachusetts (Fort Devens) to support Task Order 005 of Contract DAAA15-91-D-0008 with the U.S. Army Environmental Center (USAEC). This RI Report details the results of the RI and previous investigations completed at the AOC 43J, - which were completed in accordance with relevant U.S. Environmental Protection Agency (USEPA) and USAEC guidance. Fort Devens is currently on the National Priorities List (NPL) and AOC 43J is considered a subsite to the entire installation. The RI field investigation was conducted at AOC 43J during September and October 1994 and included a seismic survey, subsurface soil sampling for field analysis at 47 locations using ABB-ES' TerraProbe% system, installation of six water table groundwater monitoring wells, completing 15 soil borings with subsurface soil sampling for field and off-site laboratory analysis, and two rounds of groundwater sampling from six new and seven existing monitoring wells. The scope of work for this RI at AOC 43J was specified by the USAEC based on previous studies and investigations, and USEPA and Massachusetts Department of Environmental Protection (MADEP) comments on previous investigations and reports. USAEC directed this RI at Fort Devens to evaluate the nature and distribution of the contamination in soil and groundwater downgradient and crossgradient of the former waste oil -and historic gas station UST. In general, the efforts associated with this RI have generated a conceptual model that identifies the source of the detected soil and groundwater contamination to be waste oil and gasoline floating on the water table and in the soil at and directly east (downgradient) of, the former UST locations.

DTIC

*Contamination; Environment Protection; Gasoline; Wastes*

**20080001963** Library of Congress, Washington, DC USA  
**NATO and Energy Security**

Gallis, Paul; Mar 21, 2006; 7 pp.; In English

Report No.(s): AD-A473481; CRS-RS22409; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Energy security is becoming an issue of increasing importance to the USA and its European allies, as some energy producers are showing a tendency to use oil and gas as political leverage. Although most European allies believe that a market solution exists to ensure security of energy supplies, NATO has begun to discuss the issue as an allied concern. This report will be updated periodically. See also CRS Report RL32342, NATO and the European Union, by Kristin Archick and Paul Gallis.

DTIC

*North Atlantic Treaty Organization (NATO); Petroleum Products; Security*

**20080002287** NASA Marshall Space Flight Center, Huntsville, AL, USA  
**Powdered Magnesium-Carbon Dioxide Rocket Combustion Technology for In Situ Mars Propulsion**

Foote, J. P.; Litchford, R. J.; September 2007; 40 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TP-2007-215077; M-1203; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002287>

Powdered magnesium (Mg) carbon dioxide (CO<sub>2</sub>) combustion is examined as a potential in situ propellant combination for Mars propulsion. Although this particular combination has relatively low performance in comparison to traditional bipropellants, it remains attractive as a potential basis for future martian mobility systems, since it could be partially or wholly manufactured from indigenous planetary resources. As a means of achieving high mobility during long-duration Mars exploration missions, the poorer performing in situ combination can, in fact, become a superior alternative to conventional storable propellants, which would need to be entirely transported from Earth. Thus, the engineering aspects of powdered metal combustion devices are discussed including transport/injection of compacted powder, ignition, combustion efficiency, combustion stability, dilution effects, lean burn limits, and slag formation issues. It is suggested that these technological issues could be effectively addressed through a multiphase research and development effort beginning with basic feasibility tests using an existing dump configured atmospheric pressure burner. Follow-on phases would involve the development and testing

of a pressurized research combustor and technology demonstration tests of a prototypical rocket configuration.

Author

*Carbon Dioxide; Magnesium; Mars (Planet); Powder (Particles); Combustion; Rocket Engine Design; Metal Propellants; Fabrication*

**20080002535** Applied Research Associates, Inc., Tyndall AFB, FL USA

**Design and Analysis of Alternative High Heat Flux Sources for Materials Fire Testing - PREPRINT**

Dierdorf, Douglas S; Menchini, Christopher P; Sellers, Ramon D; Carr, Jr, Virgil J; Oct 18, 2007; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4918

Report No.(s): AD-A473362; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The majority of aircraft crash accidents involve ignition of the fuselage due to a burning external jet fuel fire. Because of this, occupant fatalities become heavily reliant upon the aircraft body remaining intact as exterior fire impinges upon it. To increase survivability, the Federal Aviation Administration (FAA) has developed a medium-scale laboratory test to analyze the burnthrough resistance of aircraft skin components using an impinging jet flame from an oil burner to simulate a real world fire condition. Over the years, the procedure has been forcibly refined due to inconsistent results among participating laboratories for instabilities in the jet flame. Although not an FAA testing goal, the test procedure also makes analysis of material off-gasses difficult due to comingling of both the oil burner and aircraft skin combustion flames. Since aircraft construction has transitioned largely to composite materials in recent years, an understanding of burnthrough resistance and fire behavior for these new materials has not been well documented in the open literature. In response, the Air Force Research Laboratory's (AFRL) Fire Research Group (RXQD) is developing high heat flux burner technology to replace the FAA oil burner to provide easier set-up, greater consistency, and simplicity in analyzing results for the pyrolysis of advanced composite materials. The overall objective is to use computational tools to design and analyze the performance of a plasma air torch and infrared emitter bank relying on core convective and radiant heat transfer technology, respectively. Successful validation of these models will lead to the development of computational tools that will help predict the onset of pyrolysis under multiple heat stress configurations. Successful experimental validation of these models will ultimately help develop safer, advanced materials

DTIC

*Aircraft Accidents; Combustion; Design Analysis; Fires; Fuselages; Heat Flux; Jet Engine Fuels*

**20080002823** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Evaluation of Catalytic and Thermal Cracking in a JP-8 Fueled Pulsed Detonation Engine (Postprint)**

Helfrich, Timothy M; Schauer, Frederick R; Bradley, Royce P; Hoke, John L; Sep 2007; 15 pp.; In English

Contract(s)/Grant(s): Proj-3048

Report No.(s): AD-A473517; AFRL-RZ-WP-TP-2007-242; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473517>

Pulsed detonation engines (PDEs) depend on rapid ignition and transition from deflagration to detonation. The prospect of converting the PDE from experimental to operational use necessitates a considerable reduction in the time required to ignite and detonate a liquid hydrocarbon fuel in air, such as JP-8. This research effort is focused on PDE operation enhancements using dual detonation tube, concentric-counter-flow heat exchangers to elevate the fuel temperature levels sufficiently to induce thermal cracking. Additionally, a zeolite catalytic coating is applied to the heat-exchanger surfaces to stimulate further cracking of the fuel and reduce coke deposition. To quantify the PDE performance, three parameters are examined: ignition time, deflagration-to-detonation transition (DDT) time, and DDT distance. Once cracked, the JP-8/air mixture results in a shorter ignition time, DDT time, and DDT distance for the majority of equivalence ratios, with a reduction in ignition time of up to 60% at 908 K, as compared to flash vaporized JP-8/air mixtures. Furthermore, both the ignition and detonability limits are expanded by cracking the fuel, with lean limits at an equivalence ratio of 0.75. Coke deposition found in the fuel filter consists of carbon as well as substantial concentrations of silicon and aluminum, due to breakdown of the silica-alumina zeolite structure. Additionally, poisoning of the catalyst is shown to occur after five hours of operation, although no degradation in performance was observed.

DTIC

*Catalysts; Cracking (Chemical Engineering); Detonation; Jet Engine Fuels; JP-8 Jet Fuel; Pulse Detonation Engines*

31  
**ENGINEERING (GENERAL)**

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

**2008000551** Air Force Research Lab., Hanscom AFB, MA USA

**Methods for Locating Stray-Signal Sources in Anechoic Chambers (PREPRINT)**

Hansen, Thorkild B; Marr, Richard A; Hsia, Justin N; Kim, Kristopher T; Lammers, Uve H; Perez, Jimmie J; Tanigawa, Timothy J; Sep 7, 2007; 45 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A472305; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Two complementary methods for locating stray-signal sources in anechoic chambers are investigated and applied to measurement data. Both methods process single-frequency near-field data collected on a planar surface to reconstruct field values (images) elsewhere. The first method uses plane waves to back propagate the scan-plane data and is well suited for FFT-based rapid reconstruction of images on planar surfaces parallel to the scan plane. The second method uses the simple spherical-wave focusing technique and is flexible in that it can be used to generate images on either planar or non-planar surfaces from data collected on either planar or non-planar surfaces. Both methods include a spatial filter for isolating selected plane wave spectrum components. The two methods are used in combination to successfully locate the strong multiple-bounce stray signals that degrade the quiet zone of a near field bistatic RCS facility. Weaker diffraction stray signals are also imaged. Subsequent scan data confirms that the suppression of these stray signals indeed substantially improves the quality of the quiet-zone.

DTIC

*Anechoic Chambers; Measurement; Plane Waves; Position (Location); Radar Echoes*

**2008000601** Rochester Inst. of Tech., NY USA

**Defense Systems Modernization and Sustainment Initiative**

Nasr, Nabil; McCarthy, Edward; Haselkorn, Michael; Thurston, Michael; Sep 18, 2007; 62 pp.; In English

Contract(s)/Grant(s): N00014-05-01-0708

Report No.(s): AD-A472396; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Center for Remanufacturing and Resource Recovery (NC3R) at Rochester Institute of Technology has successfully researched and demonstrated technologies that are able to enhance the performance of defense weapons and support systems, while managing total life-cycle costs. The program areas supported by this ONR grant were Asset Health Management (AHM), Life-cycle Engineering and Economic Decision Systems (LEEDS), Material Aging, and Modernization through Remanufacturing and Conversion (MTRAC). NC3R accomplishments included the development of AHM data analysis and prognostic algorithm development for critical ship and ground vehicle components; AHM system deployment on transportation platforms; LEEDS multimodal maintenance application demonstration; reverse engineering and upgrade for aircraft components; and, platform reliability availability and maintainability assessment.

DTIC

*Maintainability; Maintenance; Manufacturing; Resources Management*

**2008000813** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Report on Contracting Practices at the Major Range and Test Facilities Base**

Jolliffe, Richard B; Burton, Bruce A; Mehlman, Benjamin A; Simpson, Michael E; Gravely, Carrie J; Jeffery, Shaun B; Parker, Gloria; Vennemann, Bernard M; Westphal, Christopher D; Milner, Jillisa H; Dec 27, 2006; 62 pp.; In English

Report No.(s): AD-A472321; ODIGAD-D-2007-036; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Major Range and Test Facilities Base is a national asset that is sized, operated, and maintained primarily for DoD test and evaluation support missions, but may also be available to all users having a valid requirement for its capabilities. The audit objective was to determine whether contracting officials at the Major Range and Test Facilities Base complied with the requirements of the Federal Acquisition Regulation in awarding and administering service and technical support contracts. We selected service contracts at three Army, three Navy, and three Air Force locations to review the award and administration procedures. Our audit included 10 contracts with a total dollar value of more than \$7.6 billion for performance periods from FY 1997 through FY 2015. In March 2004, DoD established the Defense Test Resource Management Center to plan and assess the adequacy of the Major Range and Test Facilities Base. The Defense Test Resource Management Center is a DoD field



activity under the authority, direction, and control of the Under Secretary of Defense for Acquisition, Technology, and Logistics.

DTIC

*Contract Management; Defense Program; Procedures; Ranges (Facilities); Test Facilities*

**20080000896** Chinese Inst. of Engineers, Taipei, Taiwan, Province of China

**Journal of the Chinese Institute of Engineers: Vol. 30, No. 1**

Chen, Shi-Shuenn, Editor; Tsai, Hsien-Lung, Editor; Chern, Ming-Jyh, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai; Chen, Jean-Len, Editor; Shieh, Ce-Kuen, Editor; Chao, Ching-Kong, Editor; Chang, Kai, Editor, et al.; January 2007; ISSN 0253-3839; 191 pp.; In English; See also 20080000897 - 20080000915; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The following topics are discussed: Neutronic Analysis of Lithium Hydride (LiH) Material in A (D, T) Driven Hybrid Blanket; Mesa Etching Characterization of InSb for High Density Image Array Applications; Mass Transfer from the Base Plate around Protruding Blocks in a Th Rectangular Channel Flow; Near-Resonance Behavior of a Viscoelastically Damped Building Model Under Uniform Flows; High Resistivities Associated with a Newly Formed LNAPL Plume Imaged by Geoelectric Techniques - A Case Study; A Time-Space Network Model for Work Team Scheduling After a Major Disaster; A Novel Redundancy Index for Kinematically Redundant Manipulators; The Design of a Genetic Algorithm-Based Fuzzy Pulse Pump Controller for a Frequency-Locked Servo System; Posture Estimation and Tracking of an Autonomous Mobile Robot Using a Laser Scanner with Retro-Reflectors; Development of a Software Tester for Distributed Object-Oriented Systems; A Silicon MEMS Micro Power Generator for Wearable Micro Devices; Modeling Nonlinear Rate Dependent Behaviors of Composite Laminates; Interference in Intradiscal Pressure Measurement Using a Needle-Type Pressure Transducer; Effect of Sodium Dodecyl Sulfate (SDS) on Bubble Characteristics and Ozone Transfer in a Bubble Column; Preparation and Properties of Polymer Impregnated Concrete; A Fuzzy Hierarchical Clustering Method for Clustering Documents Based on Dynamic Cluster Center; Designing and FPGA Evaluation of Modified Discrete Fourier Transform for Fault Currents Filtering; Electric Fields Coupling into a Vehicle Exposed to Lightning Electromagnetic Pulse Waves; and Magneto-Hydrodynamic Flow of a Second Order Fluid over a Stretching Sheet with Suction.

Derived from text

*Field-Programmable Gate Arrays; Microelectromechanical Systems; Laser Applications; Cluster Analysis; Software Engineering; Servomechanisms; Pressure Measurement; Controllers; Electric Generators*

**20080000898** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

**Modeling Nonlinear Rate Dependent Behaviors of Composite Laminates**

Tsai, Jia-Lin; Wang, Hamvey; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 141-148; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

This study aims to propose a simple explicit model for predicting the nonlinear rate dependent behaviors of composite laminates. Using one parameter plastic potential to describe the flow rule, the viscoplasticity model is expressed as a single master effective stress-effective plastic strain curve in the form of a power law with a rate dependent amplitude. Based on the viscoplasticity model together with the laminated plate theory, the incremental form of the constitutive formulation is derived to model the nonlinear rate dependent behaviors of composite laminates. Symmetric glass/ epoxy and graphite/epoxy composite laminates were tested at three different strain rates and the experimental results were then compared with the model predictions. It was indicated that the proposed constitutive model is effective in characterizing the nonlinear rate dependent behaviors of composite laminates at strain levels up to 1%.

Author

*Laminates; Mathematical Models; Nonlinearity; Strain Rate; Mechanical Properties; Composite Materials*

**20080000899** National Taipei Univ. of Technology, Taipei, Taiwan, Province of China

**Preparation and Properties of Polymer Impregnated Concrete**

Chen, Cheng-Hsin; Huang, Ran; Wu, Jiann-Kuo; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 163-168; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

Azobisisobutyronitrile (AIBN), benzoyl peroxide (BPO) and lauroyl peroxide (LPO) were selected to mix with methyl methacrylate, ethyleneglycol dimethacrylate and trimethylolpropane trimethacrylate, respectively. Three hundred fifty cylindrical concrete specimens with a constant water/cement ratio of 0.65 were cast and cured. For a given impregnation process, the polymer loadings of impregnated specimens using BPO or LPO as initiator were between 5.2 and 6.5%, and the

impregnation depths varied from 15 to 19 mm, depending on the viscosity of the monomer mixture. However, in AIBN specimens full impregnation depth (50 mm) was observed, which resulting from higher activated energy in the monomer mixtures. Mechanical properties of specimen were improved by impregnation. No chloride ions or carbon dioxide passed through most of the impregnated specimens after 600-hour exposure.

Author

*Cements; Monomers; Impregnating; Peroxides; Acrylates; Methyl Compounds; Water; Viscosity; Concretes*

**20080000900** National Defense Univ., Taipei, Taiwan, Province of China

**Designing and FPGA Evaluation of Modified Discrete Fourier Transform for Fault Currents Filtering**

Yu, Chi-Shan; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 173-178; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-92-2213-E-014-015; Copyright; Avail.: Other Sources

In protection relaying, the discrete Fourier transform (DFT) is the most widely used technique to obtain the fundamental phasor. However, when the fault current contains a decaying dc component, DFT can't obtain an accurate fundamental phasor. This work develops a modified discrete-Fourier-transform (MDFT) algorithm for fault currents filtering. Meanwhile, the field-programmable gate array (FPGA) is also used to evaluate the filter performance. Recursive computation is also developed to reduce the computation burden and FPGA logic elements utilization. The proposed algorithm is evaluated by some test cases in an FPGA environment. The results indicate that the proposed algorithm is accurate and has potential for practical applications.

Author

*Fourier Transformation; Field-Programmable Gate Arrays; Discrete Functions; Algorithms*

**20080000901** National Tsing Hua Univ., Hsinchu, Taiwan, Province of China

**A Silicon MEMS Micro Power Generator for Wearable Micro Devices**

Huang, Wen-Sheh; Tzeng, Kung-Ei; Cheng, Ming-Cheng; Huang, Ruey-Shing; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 133-140; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

In this paper, a prototype vibration-induced micro power generator is fabricated and tested to investigate the feasibility of a wearable silicon micro power source. This prototype device consists of an energy-collecting electroplated copper coil of 0.1 mm thickness, a nickel-iron alloy (NiFe) suspension spring and a commercially available neodymium iron boron (NdFeB) magnet of dimension 2 mm x 2 mm x 1 mm. The overall size of the micro power generator is 6 mm x 6 mm x 1mm. The average generated power is 0.32 uW when the device is tapped gently with fingers. This tapping mimics the vibration when the device is worn on a person, and demonstrates power generation feasibility by general human activity. Average power of 1.44uW was measured when the device was placed on a vibration bed excited with a sinusoidal signal of 50 micrometer amplitude.

Author

*Microelectromechanical Systems; Silicon; Miniaturization; Electric Generators; Electrical Engineering; Fabrication*

**20080000902** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**Interference in Intradiscal Pressure Measurement Using a Needle-Type Pressure Transducer**

Wang, Jaw-Lin; Kuo, Ya-Wen; Chang, chia-Chung; Yang, Been-Der; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 149-153; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-93-2320-B-002-030; Copyright; Avail.: Other Sources

The invasive needle-type pressure transducer is widely used in the measurement of intradiscal pressure (IDP). However, the protocol for measuring IDP is not a standard procedure. Most of the in vitro studies employ an anterior insertion of the transducer while most of the in vivo studies employ a lateral insertion. The interference between transducer and disc needs to be understood before comparing the results of the two different protocols. Sixteen porcine one-motion segments (T9-10, T11-12) were used. The transducers were inserted into the disc from either the anterior site (N = 9) or the lateral site (N = 7). All specimens had axial compressive force applied on eight locations along the mid-sagittal line on the top of the cast to simulate flexion, neutral, and extension bending moments. The effects of bending moment and alignment of pressure transducers on the IDP were analyzed. Both the alignment of the transducer and bending moment affect the measurement of IDP. The IDP measured by an anterior-inserted-transducer (ant-IDP) declined gradually from flexion through neutral to extension. The IDP measured by a lateral-inserted-transducer (lat-IDP) during flexion and extension is higher than the IDP measured during the neutral condition. The ant-IDP is higher than the lat-IDP during flexion and neutral, but lower during

extension. The ant-IDP may be overestimated, compared to lat-IDP, during flexion and neutral but underestimated during extension. We suggest that lateral insertion of transducer may be a better choice for both in vivo and in vitro IDP measurement.

Author

*Pressure Measurement; Transducers; In Vitro Methods and Tests; Pressure Sensors; Bending Moments*

**20080000903** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**A Fuzzy Hierarchical Clustering Method for Clustering Documents Based on Dynamic Cluster Center**

Chen, Shyi-Ming; Chen, Liang-Yu; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 169-172; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-92-2213-E-011-074; Copyright; Avail.: Other Sources

In this paper, we present a new fuzzy hierarchical clustering method based on dynamic cluster centers to deal with document clustering, where the terms in the documents are used to construct dynamic cluster centers, and the cluster centers will change when different document clusters are merged. The degrees of similarity between document clusters are calculated based on these dynamic cluster centers. The experimental results show that the proposed method gets a higher average clustering precision rate for clustering documents than the method presented in (Horng, et al., 2002).

Author

*Cluster Analysis; Analogies; Fuzzy Systems; Accuracy; Frequencies*

**20080000904** National Chung Hsing Univ., Taichung, Taiwan, Province of China

**Posture Estimation and Tracking of an Autonomous Mobile Robot Using a Laser Scanner with Retro-Reflectors**

Tsai, Ching-Chih; Lin, Hung-Hsing; Hsu, Jui-Cheng; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 103-114; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-89-2213-E-005-049; Copyright; Avail.: Other Sources

This paper develops methodologies and techniques for posture estimation and tracking of an autonomous mobile robot (AMR) using a laser scanner with at least three retro-reflectors. A novel three-point triangulation method using the laser scanner is presented to find an initial posture of the robot and then an extended information filtering (EIF) method is used to improve the accuracy of the robot's posture estimation. The sensitivity to measurement errors with respect to different reflector arrangements is investigated as well. With the odometric information from the driving wheels, an EIF-based posture tracking algorithm is proposed to continuously keep track of the robot's posture at slow speeds. Simulation and experimental results are compared to show the efficacy and usefulness of the proposed method. The proposed method can be applied to several mobile robots navigating over flat terrain in the areas of manufacturing factories, offices, hospitals, homes and etc.

Author

*Posture; Estimating; Autonomy; Robots; Mobility; Laser Applications; Retroreflectors; Optical Scanners*

**20080000905** Ling Tung University, Taichung, Taiwan

**Mass Transfer from the Base Plate around Protruding Blocks in a Th Rectangular Channel Flow**

Wang, Kun-Chieh; Chiou, Ruey-Tsorn; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 17-29; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

This investigation explores the mass transfer from the base plate around protruding blocks in a fully-developed rectangular channel flow. The naphthalene sublimation scheme was used to measure the level of mass transfer from the base plate around blocks. The effects of the Reynolds number, blockage ratio, and block spacing on the local mass transfer coefficient have been widely discussed. For flow over a single block, different styles of Sherwood number hump occur on the base plate around the block, which can be attributed to the horse-shoe vortex, side vortices and arch-shaped vortex around the block. Changes in the Reynolds number and blockage ratio significantly change the structure of the above vortices, thus inducing a profound variation in the local mass transfer. For flow over two blocks in tandem, an increase in the block spacing changes the Sherwood number distribution from 'Wave Type' to 'U Type' on the base plate between blocks.

Author

*Mass Transfer; Channel Flow; Reynolds Number; Naphthalene; Spacing; Vortices*

**20080000906** National Formosa Univ., Yunlin, Taiwan, Province of China

**The Design of a Genetic Algorithm-Based Fuzzy Pulse Pump Controller for a Frequency-Locked Servo System**

Chen, Liang-Rui; Hsieh, Guan-Chyun; Lee, Hahn-Ming; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 91-102; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

In this paper, a Genetic Algorithm-based Fuzzy Pulse Pump Controller (GAFPPC) is proposed to realize a

Frequency-Locked Servo system (FLS). In order to get a better convergence and a higher diversity in the genetic algorithm, a Mixed Elitist and Fuzzy Clustering (MEFC) selection strategy is proposed. A prototype of the GFCFLS is tested to assess the system performance. In comparison with the FPC and the SVDPC, the acquisition time of the GA-FPPC is improved over than 18%. In particular, there is no overshoot in GA-FPPC for any servo distances. In addition, the GA-FPPC has the best tracking performance of these three controllers. These demonstrate that GA-FPPC can actually provide an appropriate pump voltage to fast locking response without overshoot, meeting the theoretical prediction.

Author

*Controllers; Frequencies; Genetic Algorithms; Servomechanisms; Fuzzy Systems; Mathematical Models*

**20080000907** Nanya Inst. of Technology, Jhongli, Taiwan, Province of China

**Magneto-Hydrodynamic Flow of a Second Order Fluid over a Stretching Sheet with Suction**

Lin, Jaw-Ren; Liang, Long-Jin; Chien, Rean-Der; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 183-188; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

In this paper we are mainly concerned with the flow characteristics of an electrically conducting second order fluid over a stretching sheet with suction velocity in the presence of a transverse magnetic field. By the use of a similarity transformation, the nonlinear boundary layer equations are transformed into a fourth-order nonlinear ordinary differential equation. A closed-form solution of the exponential type for the surface velocity gradient is found to depend upon the visco-elastic parameter of the second order fluid, the magnetic parameter arising from the externally applied magnetic field and the suction parameter due to the suction of the wall. From a cubic equation derived, three special cases of previous studies by Crane (1970), Chakrabarti and Gupta (1979) and Dandapat and Gupta (1989) are included in the present study. According to the results obtained, the magnitude of the surface velocity gradient of an electrically conducting second order fluid over a stretching sheet increases with both of the visco-elastic parameter and the suction parameter. When an externally transverse magnetic field is applied with the magnetic parameter  $M = 5$ , the effects of the visco-elastic parameter upon the magnitude of the surface velocity gradient are more pronounced for the suction parameter  $R > -1/\text{square root of } 5$

Author

*Magnetic Fields; Conducting Fluids; Flow Characteristics; Suction; Boundary Layer Equations; Differential Equations*

**20080000908** Yuan-Ze Univ., Taoyuan, Taiwan, Province of China

**Electric Fields Coupling into a Vehicle Exposed to Lightning Electromagnetic Pulse Waves**

Chen, Hsing-Yi; Kuo, Yu-Feng; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 179-182; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

The finite-difference time-domain (FDTD) method is used to study the electric fields coupling into a vehicle exposed to lightning electromagnetic pulse (LEMP) waves. From simulation results, it is found that the maximum shielding effectiveness of about 72.5% occurred inside the vehicle. The shielding effectiveness can be highly improved by including a good conducting material in the windshield and auto glass. Inside the vehicle, it is also found that there are various reflections around the vehicle's body due to the influence of the vehicle structure on the incident LEMP waves.

Author

*Finite Difference Time Domain Method; Electric Fields; Time Domain Analysis; Electromagnetic Pulses; Lightning; Finite Difference Theory*

**20080000909** National Pingtung Univ. Science and Technology, Pingtung, Taiwan, Province of China

**Near-Resonance Behavior of a Viscoelastically Damped Building Model Under Uniform Flows**

Tsai, Meng-Hao; Kasai, Kazuhiko; Tamura, Tetsuro; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 43-52; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

Wind-tunnel tests on an aeroelastic building model with viscoelastic dampers are conducted to investigate the vortex-induced response of a viscoelastically damped building under uniform flows. Performance of the viscoelastically damped model is compared with that of a viscously damped model simulated by the building model with silicone oil. The damping ratio provided by the viscoelastic damper is varied by changing the temperature of the damper. Dynamic characteristics of the damped model are estimated from free vibration tests. It is observed that the near-resonance response of the viscoelastically damped model is similar to that of the viscously damped model. The vortex-induced responses of both models are also similar when the damping ratio is increased to suppress resonant behavior. Test results indicate that, for

practical applications of viscoelastic dampers to high-rise buildings with low added damping ratio, the viscoelastically damped model may be adequately equivalent to a viscously damped model.

Author

*Aeroelasticity; Viscoelastic Damping; Wind Tunnel Tests; Vibration Tests*

**20080000910** National Defense Univ., Taipei, Taiwan, Province of China

**A Novel Redundancy Index for Kinematically Redundant Manipulators**

Hung, Min-Hsiung; Ting, J. K.; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 77-90; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

This work proposes a novel quantitative measure of redundancy, called a Refined Redundancy Index (RRI), for kinematically redundant manipulators. The constrained inverse kinematics problem is formulated at the joint-rate level. RRI is then defined as the normalized magnitude of the solution spaces, based on the fact that a larger solution space corresponds to greater redundancy. The value of RRI is between zero and one, and a larger RRI implies greater redundancy. Accordingly, the redundancy of redundant manipulators is effectively quantified. Unlike joint-angle-level approaches, the method proposed here does not suffer from the annoying problem where a single primary task corresponds to several different regions of joint angles. The proposed RRI is computationally efficient and easy to apply to real-time applications. Simulation results show that, with RRI a manipulator can adjust its motion on-line to prevent motion failure, and the execution time of a given task can be reduced considerably, compared to using conventional approaches. It is believed that RRI can be applied to a variety of applications of redundant manipulators in the future.

Author

*Inverse Kinematics; Manipulators; Redundancy; Motion; Simulation*

**20080000911** National Central Univ., Chung-Li, Taiwan, Province of China

**A Time-Space Network Model for Work Team Scheduling After a Major Disaster**

Yan, Shangyao; Shih, Yu-Lin; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 63-75; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-93-2211-E-008-023; Copyright; Avail.: Other Sources

In this research we develop a novel time-space network model with the objective of minimizing the length of time needed for emergency repair, subject to related operating constraints. The model is expected to help the decision maker to efficiently set an emergency repair schedule within a limited time. Our model is an integer network flow problem with side constraints. To efficiently solve realistically large problems in practice, we develop a heuristic algorithm. To evaluate our model and the solution algorithm, we exhibit a case study. The results show that the model and the solution algorithm could be useful in practice.

Author

*Mathematical Models; Scheduling; Networks; Relativity; Heuristic Methods; Algorithms; Disasters*

**20080000912** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**Effect of Sodium Dodecyl Sulfate (SDS) on Bubble Characteristics and Ozone Transfer in a Bubble Column**

Chen, Hua-Wei; Ku, Young; Lin, Shi-Yow; Chang, Ching-Yuan; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 155-161; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-90-2211-E-011-025; Copyright; Avail.: Other Sources

The rising of ozone-containing bubbles in a bubble column was examined by a high-speed micro video camera. The shape of the bubbles shifted from spherical to ellipsoidal during their rise along the column. The experimental observation indicated that the average diameter at the X-axis of the bubbles was markedly increased after the bubbles left the diffuser because the gas pressure inside the bubbles was not balanced with the surrounding water pressure. However, the shape of bubbles was kept spherical along the column during an experiment conducted in the presence of sodium dodecyl sulfate (SDS), a commonly used surfactant. In pure water, the intrinsic interfacial areas for the bubble column were determined to be in the range of 2.958 to 8.607  $m(\text{exp}^{-1})$  for experiments conducted with the gas flow rate from  $3.25 \times 10(\text{exp}^{-6})$  to  $1.16 \times 10(\text{exp}^{-5})$  cubic meters per second, and the intrinsic mass transfer coefficient of ozone,  $k(\text{sub} L)$ , was found to be 0.0004 meters per second at 25 C and 1 atm. The determined overall and the specific gas-liquid contact area were notably increased from 0.0059 square meters and 2.958  $m(\text{exp}^{-1})$  to 0.0197 square meters and 8.964  $m(\text{exp}^{-1})$ , respectively, with the presence of 0.0346 mM of SDS in the aqueous solution.

Author

*Bubbles; Mass Transfer; Ozone; Sodium Sulfates; Aqueous Solutions; Surfactants*

**20080000913** Erciyes Univ., Kayseri, Turkey

**Neutronic Analysis of Lithium Hydride (LiH) Material in A (D, T) Driven Hybrid Blanket**

Akansu, Selahaddin Orhan; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 1-10; In English; See also [20080000896](#); Copyright; Avail.: Other Sources

In this study, neutronic performance of Lithium Hydride (LiH) material is analyzed in a D-T driven hybrid blanket cooled by flibe (Li<sub>2</sub>BeF<sub>4</sub>). The hybrid blanket is fuelled by UO<sub>2</sub> from LWR fuel rod, LWR spent fuel rods and CANDU spent fuel rods. Energy production, tritium breeding, neutron leakage and fissile fuel breeding are considered. Volume fractions are selected as 1, 2, 3, 4 and 5. LiH thickness is increased from 0 to 80 cm. The number of rows is selected as 10 to 20. When the volume fractions increase, TBR values decrease. When the LiH thickness reaches 50 cm, TBR values reach the point of saturation. At this thickness, TBR values of Model- I1 (P. 4) are higher than those of Model-I (P. 4). The M energy multiplication factor has nearly the same tendency in both models. Neutron leakage values of Model-I1 (for DR(sub LiH) = 5 0 cm) are lower than that Model-I. Although the fissile fuel breeding rate values of Model-I and Model-II are almost the same, the values of Model-I are a little higher than Model-II. Therefore, it is concluded that LiH material is suitable for using, when neutronic behaviour is considered.

Author

*Lithium Hydrides; Spent Fuels; Fissile Fuels; Neutrons; Tritium*

**20080000915** National Cheng Kung Univ., Tainan, Taiwan, Province of China

**Development of a Software Tester for Distributed Object-Oriented Systems**

Cheng, Fan-Tien; Su, Yu-Chuan; Wang, Chin-Hui; Wu, Shang-Lun; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 115-131; In English; See also [20080000896](#)

Contract(s)/Grant(s): NSC-90-2212-E-006-028; NSC-91-2212-E-006-061; Copyright; Avail.: Other Sources

It is well-known that testing and debugging in software development demand a great deal of resources, and open-environment architecture of general distributed systems tends to increase the complexity of testing. To resolve the problems mentioned above, this work proposes a software tester for distributed object-oriented systems. This software tester possesses a test-plan wizard which can generate a test-result template and test-plan execution codes according to class diagrams and sequence diagrams. The software tester is applicable to tests of an individual unit or module or a whole distributed object-oriented system as long as the functions and operations of the component or system can be presented with only class diagrams (as well as interface definitions) and sequence diagrams generated by the tools used during the software development. Two examples are applied to demonstrate the usage of this software tester, performing a unit test and a system integration test. Research results indicate that this software tester enables integrated planning of the software development and testing, reduces testing cost, and improves overall development efficiency.

Author

*Object-Oriented Programming; Software Engineering; Performance Tests; Distributed Processing; Program Verification (Computers)*

**20080000918** Naval Research Lab., Washington, DC USA

**2006 NRL Review**

Jan 2006; 222 pp.; In English

Report No.(s): AD-A472411; No Copyright; Avail.: Defense Technical Information Center (DTIC)

NRL's mission is to conduct a broadly based multidisciplinary program of scientific and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems and ocean, atmospheric and space sciences and related technologies.

DTIC

*Research Management; Atmospheric Chemistry; Meteorology; Atmospheric Physics*

**20080000927** Chinese Inst. of Engineers, Taipei, Taiwan, Province of China

**Journal of the Chinese Institute of Engineers, Volume 30, No.2**

Chen, Shi-Shuenn, Editor; Tsai, Hsien-Lung, Editor; Chern, Ming-Jyh, Editor; Tsai, Hsien-Lung, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai, Editor; Lee, San-Liang, Editor; Shieh, Ce-Kuen; Chao, Ching-Kong, Editor, et al.; March 2007; ISSN 0253-3839; 184 pp.; In English; See also [20080000928](#) - [20080000947](#); Original contains black and white illustrations; Copyright; Avail.: Other Sources

Topics discussed include: Pseudo-Model Technique of Biological Tissues for the Development of NIR Diffuse Optical

Tomography; An Improved Estimator Using Multiple Sensor Data Fusion for Radar Maneuvering Target Tracking Systems; On Tool-Chip Interface Stress Distributions Ploughing Force and Size Effect in Machining Inconel-71 8 and AIS14340; Regularization of Nearly Singular Integrals in the Boundary Element Analysis for Interior Anisotropic Thermal Field near the Boundary; Effects of Cohesive Energy on Tribological Performance of Nanoscale Sliding Systems Under Different Force Fields; Buckling of Thin Plates with V-Grooves Under Axial Impact; On Analysis of Passive Underwater Acoustic Damping Materials; Improving the Reliability and Usability of Structural Shaping Optimization - the Contour Natural Shape Function; Evaluation of Environmental Effects on Mechanical Properties and Characterization of Creep Behavior of PMMA; Shear-Thinning Effects in Annular-Orifice Viscous Fluid Dampers; A Probabilistic Seismic Risk Analysis of Building Losses in Taipei: An Application of HAZ-Taiwan with its Pre-Processor and Post-Processor; Reinforced Reactive Powder Concrete Plate Under Cyclic Loading; Development of a Virtual Keyboard Based on Button Tracking Using Magnetic Induction; A Label-Based Information Flow Control Model for Object-Oriented Systems; Controlling Information Access in Workflow Management Systems Using RBAC-Based Model; Block Attacks on Gollmann Cascades; A Dual-Purpose Signature for Authentication on UMTS; Numerical Evaluation of Thermal Cycling Reliability of High Performance Flip-Chip Package Assembly Using Submodeling Analysis; Studying an Approach Solution of I/O Buffer Information Specification (IBIS) Model; and Evaluating Taiwan's Air Quality Variation Trends Using Grey System Theory.

Derived from text

*Tomography; Tribology; Mechanical Properties; Thermal Cycling Tests; Systems Analysis; Acoustic Attenuation; Composite Materials; Field Theory (Physics); Information Management; Magnetic Induction; Management Systems; Stress Distribution; Underwater Acoustics*

**20080000928** Environmental Protection Administration, Taipei, Taiwan, Province of China

#### **Evaluating Taiwan's Air Quality Variation Trends Using Grey System Theory**

Chang, Shuen-Chin; Pai, Tzu-Yi; Ho, Hsin-Hsien; Leu, Horng-Guang; Shieh, Yein-Rui; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 361-367; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

According to geographical characteristics and air quality conditions, the Taiwan Environmental Protection Agency has divided the island into 7 air quality regions (AQRs) including Northern, Chu-Miao, Central, Yun-Chia-Nan, Kao-Ping, I-lan and Hwa-Tung AQRs. The grey relational grade (GRG) of all AQRs and nationwide grade were calculated to comprehend the level of contamination. Then the grey model GM (O, N) was used to evaluate the effects of 5 primary contaminants on air quality. The results indicated that the ranking of air quality for the 7 AQRs from the best to the worst were as follows: Hwa-Tung > I-lan > Chu-Miao > Northern > Yun-Chia-Nan > Central > Kao-Ping. The 5 most common contaminants from the greatest to the least were as follows: CO > SO<sub>2</sub> > NO > O<sub>3</sub> > PM<sub>10</sub>.

Author

*Air Quality; Environment Protection; Taiwan; Trends; Mathematical Models*

**20080000932** National Dong Hwa Univ., Hualien, Taiwan, Province of China

#### **Controlling Information Access in Workflow Management Systems Using RBAC-Based Model**

Chou, Shih-Chien; Wu, Chien-Jung; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 331-336; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

We developed an RBAC-based model RBAC/WF (RBAC-based workflow information access control) to control information access in workflow management systems. Primary features offered by the model are preventing workflow information leakage and adapting to dynamic role association change. This paper presents RBAC/WF and proves that the model offers the mentioned features.

Author

*Information Management; Access Control; Management Systems*

**20080000934** Advanced Semi-Conductor Engineering, Inc., Kaohsiung, Taiwan, Province of China

#### **Numerical Evaluation of Thermal Cycling Reliability of High Performance Flip-Chip Package Assembly Using Submodeling Analysis**

Kao, Chin-Li; Lai, Yi-Shao; Wang, Tong Hong; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 349-352; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

This paper applies the submodeling technique in analyzing thermal cycling reliability of high performance flip-chip ball grid array package assemblies. The packages have one-piece tunnel-type heat spreaders with different lead widths, connected

to chips using different thermal interface materials. The global model contains no solder bumps to simplify the analysis. The calculated displacement field of the global model is then interpolated on the boundary of the submodel that contains the critical solder bump. The submodel is solved using the prescribed displacement boundary conditions together with external thermal loads to evaluate thermomechanical reliability of the critical solder bump.

Author

*Thermal Cycling Tests; Reliability; Loads (Forces); Chips; Solders; Boundary Conditions*

**20080000935** FEA-Opt Technology, Taiwan, Taiwan, Province of China

**Improving the Reliability and Usability of Structural Shaping Optimization - the Contour Natural Shape Function**

Chen, Shen-Yeh; Liao, Johnson W. C.; Tsai, Vincent; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 259-266; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

A new approach for parametric modeling of finite element model for shaping optimization is developed. This approach only needs the finite element mesh, yet can still rebuild a reverse parametric CAD model for efficient modeling. Special care was paid to make sure the modeling parameters were reduced, but still had enough flexibility for shaping definition. With similar algorithms of the Natural Shape Function, this approach is able to keep the original mesh pattern through out the design iterations, therefore eliminates the response noise produced by re-meshing. Unlike other methodologies, the current one only needs to define the parameters on the contour of the model. Cutting the whole domain into several subdomains is not necessary. Therefore it is called the Contour Natural Shape Function.

Author

*Computer Aided Design; Contours; Finite Element Method; Mathematical Models; Shape Functions; Shape Optimization*

**20080000936** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**Reinforced Reactive Powder Concrete Plate Under Cyclic Loading**

Chen, Yen-Jui; Chern, Jenn-Chuan; Chan, Yin-Wen; Liao, Wen-Cheng; Wu, An-Kai; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 299-310; In English; See also [20080000927](#)

Contract(s)/Grant(s): NSC-91WFA0101794; Copyright; Avail.: Other Sources

Reactive powder concrete (RPC) is a kind of high-strength and high-performance cement-based composite. The steel welded wire mesh reinforced thin reactive powder concrete plate (WMRPC) has been fabricated to explore its behavior when subjected to reversed cyclic bending. The fabrication process of specimens has been improved to control distribution, orientation and uniformity of steel fibers in the matrix of WMRPC. The aim of this study is to develop a cement-based composite plate with large energy dissipation capacity, which can be applied to structural passive control engineering. Therefore, the study focuses on the energy dissipation property of WMRPC, especially under reversed cyclic bending. In this paper, the effects of steel welded wire meshes and volume fractions of steel fibers in WMRPC are presented. Under both the monotonic static bending tests and the reversed cyclic bending tests, flexural strength, toughness, and energy dissipation ability of WMRPC are reported. The experimental results indicate that the surfaces of WMRPC flexural specimens show multiple cracks and the load versus mid-span deflection curves display the pseudo-displacement-hardening phenomenon and stable hysteretic loops that enhance energy dissipation. WMRPC provides an alternative for metals as a material of structural energy control applications.

Author

*Cyclic Loads; Powder (Particles); Concretes; Cements; Metal Fibers; Flexural Strength; Composite Materials*

**20080000937** Feng Chia Univ., Taichung, Taiwan, Province of China

**Regularization of Nearly Singular Integrals in the Boundary Element Analysis for Interior Anisotropic Thermal Field near the Boundary**

Shiah, Yui-Chuin; Shih, Yi-Shiau; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 219-230; In English; See also [20080000927](#)

Contract(s)/Grant(s): NSC94-2212-E-035-011; Copyright; Avail.: Other Sources

In this paper the previously developed scheme of integration by parts to treat the boundary thermal field is applied to calculate the interior thermal field. Also, the scheme is extended further to regularize the strongly singular integral appearing in the boundary integral equation for interior calculations of the heat fluxes. Moreover, the present work develops a semi-analytical integration scheme to regularize the hypersingular integral for the interior heat-flux calculations. All



formulations are derived for elements of arbitrary orders with general interpolation. At the end, the veracity of the scheme is illustrated by numerical examples.

Author

*Boundaries; Singular Integral Equations; Anisotropy; Integral Equations; Heat Flux*

**2008000938** Ching Yun Univ., Chung-Li, Taiwan, Province of China

**Buckling of Thin Plates with V-Grooves Under Axial Impact**

Chen, Jeng-Tang; Liu, Chun-Ho; So, Hon; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 241-249; In English; See also [2008000927](#)

Contract(s)/Grant(s): NSC 92-2212-E-002-011; Copyright; Avail.: Other Sources

This paper numerically investigates the buckling loads and the absorbed energy of thin metallic plates stamped with V-grooves. By using the dynamic-explicit FEM Code, LS-DYNA together with the mass scaling technique and contact algorithm, the collapse processes of the plates subjected to various impact velocities were simulated. The results show that the buckling-resistant properties of plates stamped with V-grooves can be more than 12-times larger than those of plates without V-grooves. Also, the results from numerical modeling show good agreement with the experiments. Therefore, the suggested model and technique are helpful in the design of thin metallic plates requiring considerable buckling resistance.

Author

*Buckling; Thin Plates; V Grooves; Metal Plates; Impact Velocity; Finite Element Method; Loads (Forces)*

**2008000941** National Yun-Lin Univ. of Science and Technology, Touliu, Taiwan, Province of China

**Block Attacks on Gollmann Cascades**

Su, Shung-Lung; Tsai, Yun-Feng; Wu, Lih-Chyau; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 337-341; In English; See also [2008000927](#); Copyright; Avail.: Other Sources

In research to date, attacks for Gollmann Cascades (Chambers and Gollmann, 1988; Menicocci, 1993; Menicocci, 1995a; Menicocci, 1995b; Meier and Staffelbach, 1992; Lee et al., 1995; Menicocci and Golic, 1999) have had to obtain information such as length of LFSR (Linear Feedback Shift Register), and primitive polynomials in order to compromise all initial states of LFSRs. The approach of this research is to find all primitive polynomials and initial states with minimum information of the length of LFSR, and the number of stages being given. Under the condition that the key stream is sufficiently long, block attacks can also be used on longer length LFSRs or longer cascades as well.

Author

*Polynomials; Feedback; Shift Registers*

**2008000943** University System of Taiwan, Taiwan, Province of China

**Pseudo-Model Technique of Biological Tissues for the Development of NIR Diffuse Optical Tomography**

Pan, Min-Chun; Huang, Wei-Hua; Shih, Yih-Lih; Pan, Min-Cheng; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 189-201; In English; See also [2008000927](#)

Contract(s)/Grant(s): NSC 93-2213-E-236-002; NSC 93-2218-E-008-007; Copyright; Avail.: Other Sources

Diffuse optical tomography (DOT) is a new tomographic technique, which is noninvasive and does not involve radiation exposure. In this paper, a self-developed near infrared (NIR) diffuse optical tomography instrument is described. and phantoms composed of Intra-lipids are discussed. The NIR optical characteristics of the homogenous Intra-lipid phantoms are measured to construct a set of databases at various concentrations, and further analysis using fitting curves is presented as well. Additionally, a pseudo-model technique for imitating biological tissues is proposed and implemented. This pseudo-model can be used to represent the same optical characteristics as real tissues. meaning that it is a viable alternative to cope with measuring limitations. Experiments reveal good results when the pseudo-model employs 1 % Intra-lipid as a background tissue that imitates pork and 3% Intra-lipid as an inclusion to mimic a bone. Due to the limitations of hardware nowadays, obviously, this pseudo-model will offer a great aid for the development and evaluation of a DOT system.

Author

*Tissues (Biology); Tomography; Diffusion; Optical Properties; Radiation Dosage*

**2008000944** Da-Yeh Univ., Lungtan, Taiwan, Province of China

**An Improved Estimator Using Multiple Sensor Data Fusion for Radar Maneuvering Target Tracking Systems**

Chung, Yi-Nung; Chen, Hsin-Ta; Chou, Pao-Hua; Yang, Maw-Rong; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 203-210; In English; See also [2008000927](#)

Contract(s)/Grant(s): NSC 93-2212-E-212-006; Copyright; Avail.: Other Sources

An algorithm for tracking multiple maneuvering targets using multiple sensor data fusion is developed in this paper. In

order to solve a complicated situation due to the multiple maneuvering tracking environment, a tracking filter and a multiple-sensor data-fusion algorithm are applied in this study. In addition, in order to solve the data association and target maneuvering situations, a computational logic, including I -step conditional maximum likelihood and a variable structure model as an adaptive maneuvering compensator, is applied to solve both data association and target maneuvering problems simultaneously. The advantage of this approach is that the sensors can be installed in either fixed or moving systems, thereby improving the tracking accuracy and the reliability of the radar surveillance. In order to verify this approach, simulations of multi-target tracking problems are conducted. Computer simulation results indicate that this approach successfully tracks multiple targets and has good performance.

Author

*Maneuvers; Multisensor Fusion; Tracking (Position); Radar Tracking; Estimators; Algorithms*

**20080000945** National Chung-Cheng Univ., Taiwan, Province of China

**On Tool-Chip Interface Stress Distributions Ploughing Force and Size Effect in Machining Inconel-718 and AIS14340**

Chen, Shao-Hsien; Kuo, Chun-Pao; Ling, Cheng-Chang; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 211-218; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

Due to the enormous engineering advancement in modern industries, the competition in manufacturing technologies has been increasingly intense as can be seen in automobile and aerospace industries. Nickel-based superalloys are widely used in the manufacture of components for aircraft turbine engines, for cryogenic tankage, liquid rockets, reciprocating engines, space vehicles, heat-treating equipment, and in petro chemical industries because of their ability to retain high strength at elevated temperatures. But, because of high strength, poor thermal diffusion and work hardening, the cutting of Nickel-based superalloys results in the life of tools and work efficiency being reduced. This paper investigates the influence of shearing and ploughing mechanisms on milling characteristics of Super-alloys by analytical force models of face milling and ball end milling processes. The effect of flank wear on shearing and ploughing cutting constants is then studied through milling experiments. According to the experimental results, increase of flank wear only affects the shearing cutting constant slightly, but the ploughing cutting constant increases significantly with flank wear.

Author

*Stress Distribution; Milling (Machining); Inconel (Trademark); Heat Resistant Alloys; Nickel Alloys; High Strength*

**20080000946** National Chung-Cheng Univ., Taiwan, Province of China

**Effects of Cohesive Energy on Tribological Performance of Nanoscale Sliding Systems Under Different Force Fields**

Jeng, Yeau-Ren; Su, Chien-Chan; Lay, Yeong-Tsyh; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 231-240; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

In nanoscale sliding systems, the cohesive energy has a fundamental influence on the tribological behavior. The present study employs a finite element method (FEM) approach to investigate the friction behavior of three slider/slab systems (soft-to-soft, hard-to-soft, and hard-to-hard) under different force fields and cohesive energies. The results indicate that the fluctuations of the normal and friction forces generated during sliding are more significant at higher values of cohesive energy in each of the three sliding systems. Furthermore, it is found that an increased cohesive energy causes more severe fracturing and adhesion phenomena in the sliding system.

Author

*Cohesion; Finite Element Method; Tribology; Sliding Friction*

**20080001066** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Navy's Proposed Business Plan for Base Realignment and Closure 2005 Recommendation 184**

Jolliffe, Richard B; Burton, Bruce A; Culp, Deborah L; Wan, Bobbie Sau; Roberts, Gwynne M; Carbo, Chasy L; Olson, Kelly M; Purkiss, Matthew J; Pingree, Colin E; Johnson, Meredith H; Sep 25, 2007; 59 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000CG-0194.000

Report No.(s): AD-A472766; IG/DOD-D-2007-127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472766>

This audit was performed in response to requests from former Congressman William M. Thomas, Congressman Elton Gallegly, and Mayor Marshall Chip Holloway (See Appendixes B, C, and D) to review the Navy's proposed business plan for consistency with the Base Realignment and Closure (BRAC) 2005 Recommendation 184 to create a Naval Integrated Weapons & Armaments (W&A) Research, Development & Acquisition, Test & Evaluation (RDAT&E) Center. Navy officials did not provide adequate documentation to support the Navy's April 2007 proposed business plan for BRAC 2005

Recommendation 184. The Navy's proposed business plan realigns only 730 civilian FTEs of the 1,741 civilian FTEs the August 3, 2005, Cost of Base Realignment Actions report slated for realignment. Due to the lack of sufficient documentation, we were not able to determine the extent to which the Navy's April 2007 proposed business plan is consistent with the approved BRAC 2005 Recommendation 184. Also, we are not able to determine the number of civilian FTEs that should be realigned under this recommendation.

DTIC

*Commerce; Navy; Planning; Research Facilities*

**20080001182** Science Applications International Corp., San Diego, CA USA

**Evaluation of 5-cm Agent Fate Wind Tunnel Velocity Profiles**

Danberg, James E; Sep 2007; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD13-03-D-0017

Report No.(s): AD-A472909; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Velocity profiles measured in 5-cm Agent Fate wind tunnels have been evaluated for conformance to specified profiles. These facilities are used to determine evaporation and desorption rates of chemical warfare agents (CWA) from various surface materials. The specified profiles represent an atmospheric boundary layer for velocity conditions of 6, 3, and 0.5 m/s at a height of 2 m. The 5-cm tunnels are designed to duplicate the part of this profile closest to the surface to provide realistic conditions for agent volatilization. The friction velocity that characterizes the flow in the wall layer of turbulent boundary layers was obtained for each profile from the semi-logarithmic region of the velocity distribution. Results show that the average friction velocities at the two highest velocities are slightly below that of the predetermined values by 7.5 and 8.4%, respectively. This difference corresponds to a systematic error in agent evaporation rate of 4-5%. Other characteristics of the velocity distributions (e.g., the intercept in the semi-logarithmic coordinates) varied significantly from the zero pressure gradient turbulent boundary layer. The low velocity measurements were found to be essentially laminar with turbulence intensity measurements confirming this laminar character.

DTIC

*Evaluation; Friction; System Effectiveness; Turbulent Boundary Layer; Velocity Distribution; Wind Tunnels*

**20080001209** Academy of Health Sciences (Army), Fort Sam Houston, TX USA

**Military Standard: Sanitary Standards for Cheese (and Related Cheese Products) Plants**

Sep 16, 1985; 35 pp.; In English

Report No.(s): AD-A472956; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This standard establishes the general sanitary requirements for cheese (and related cheese products) plants. This standard is applicable to all types of plants supplying, processing, or storing cheese and related cheese products destined for Armed Forces procurement.

DTIC

*Diseases; Food; Sanitation*

**20080001210** Academy of Health Sciences (Army), Fort Sam Houston, TX USA

**Military Standard: Sanitary Standards for Meat Processing Plants in Overseas Areas**

Jun 11, 1982; 26 pp.; In English

Report No.(s): AD-A472957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This standard establishes the general sanitary requirements for overseas area meat processing plants that do not have an active U.S. Department of Agriculture (USDA) foreign meat inspection program. This standard is intended to insure clean, wholesome food products that are free from chemical, microbiological, and physical contaminants and to prevent the transmission of foodborne disease to members of the Armed Forces.

DTIC

*Contaminants; Diseases*

**20080001262** New Mexico Univ., Albuquerque, NM USA

**Biocompatible and Biomimetic Self-Assembly of Functional**

Brinker, Jeffrey; Oct 3, 2007; 21 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0087

Report No.(s): AD-A473056; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Understand cell-directed assembly and use it to direct the formation of new bio/nano interfaces and unique cellular

behaviors -Investigated the inclusion of multiple amphipathic components to control and tailor interfacial structures and functions -Created new interfaces by incorporating non-native functional proteins to yield new functionalities Extend cell-directed assembly to immobilize various cell types -Encapsulated several new cell lines, including mammalian cells, in nano-structured hosts; investigated the evolving nano-structure and bio/nano interface with grazing incidence small angle x-ray scattering along with epifluorescence and confocal scanning laser -Used properties of nano-structure to incorporate nutrients and growth vital to different cell types in order to extend cell assembly

DTIC

*Biomimetics; Microbalances; Nanostructures (Devices); Self Assembly*

**20080001263** Jordan (Edward. C.) Co., Inc., Portland, ME USA

**Sampling Design Plan. Data Item A004. Hamilton Army Airfield, Novato, California**

Walbridge, Steve; Guay, Marcel; Nov 1990; 149 pp.; In English

Contract(s)/Grant(s): DAAA15-88-D-0006

Report No.(s): AD-A473057; No Copyright; Avail.: Defense Technical Information Center (DTIC)

E.C. Jordan has prepared a Sampling Design Plan for conducting an Environmental Investigation/Alternative Assessment at the base closure portion of Hamilton Army Airfield This document was prepared under contract to the U.S Army Toxic and Hazardous Materials Agency, Base Closure Division. The work plan is being developed for the purpose of gathering sufficient information to allow a comprehensive evaluation of the environmental conditions which exist at the base closure portion of Hamilton Army Airfield from a property transfer perspective.

DTIC

*Closures; Environment Management; Hazardous Materials; Installing; Manufacturing; Military Air Facilities; Restoration; Sampling*

**20080001406** Condition Monitoring and Diagnostic Engineering Management International, Birmingham, UK

**International Journal of COMADEM, Vol. 8, No. 2**

Rao, Raj B. K. N., Editor; April 2005; ISSN 1363-7681; 60 pp.; In English; See also 20080001407 - 20080001414; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Topics discussed include: Multi-Symptom Condition Monitoring of Critical Mechanical Systems to Design Condition Inference Agent (CIA); Nonlinear Vibroacoustical Effects in Failure Diagnosis; Model Based Diagnostics - Today and Tomorrow; Diagnostic Models of Industrial Processes; Belief Networks and Diagnostic Modelling; Use Of Non-Linear Symptoms in Technical Diagnosis; Energy Method of Diagnosing Technical & Intelligent Bio-Technical Systems & its Applications; and On-Going COMADEM Research at King Mongkut's Institute of Technology, North Bangkok.

Derived from text

*Energy Methods; Systems Engineering; Diagnosis; Failure; Mechanical Engineering*

**20080001407** King Mongkut's Inst. of Tech., Bangkok, Thailand

**On-Going COMADEM Research at King Mongkut's Institute of Technology, North Bangkok**

Raadnu, Surapol; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 48-55; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

The King Mongkut's Institute of Technology North Bangkok (KMITNB), founded in 1959 with the support of the government of the Federal Republic of Germany, is one of the premier higher education institutions in Thailand with a strong base in applied sciences, technology and engineering. The faculty of engineering, the largest of the four faculties of the institute, was founded with an aim to provide a range of professional engineering education service to meet the community and industry at the early phase of industrialization in Thailand. The degrees were established to fill a need for better-educated engineers in the practice of engineering as well as in research and development. The Machinery Health Monitoring & Tribology Laboratory (MHM & Tribo, Lab.) forms part of the production engineering department, faculty of engineering. Currently, machinery health monitoring research is combined with tribology studies. In general term, the current activities of the condition monitoring and tribology research group include: Condition monitoring studies relating to oil and wear debris and contamination analysis for industry, Developments of new and improved condition monitoring techniques, especially used oil, wear debris and contamination analysis, Fundamental of friction, lubrication and wear studies & Maintenance strategy studies for productivity improvement.

Author

*Tribology; Technologies; Mechanical Engineering; Systems Health Monitoring; Petroleum Products*

**20080001408** Silesian Univ. of Technology, Poland

**Belief Networks and Diagnostic Modelling**

Cholewa, Wojciech; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 30-35; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

A general approach of methodology related to diagnostic of machinery is based on passive and/or active diagnostic experiments. Objects of this research are often represented by few examples, which make experimental verification of applied models difficult. It requires that specialists' opinions have to be taken into account as an additional knowledge. In the paper particular attention is paid to a special role that can be played in technical diagnostics by belief networks. A new mixed approach was proposed. Inverse models co-operates with special reasoning systems making use of belief networks. A general introduction to inverse models and belief networks was also presented. One explained that quality of diagnostic belief networks depends on quality of parameters being introduced on the basis of specialists' opinions. Effectiveness of the application of these networks depends on successful solutions of particular optimization tasks related to their verification and validation. Possibilities for improving these networks were also discussed.

Author

*Belief Networks; Mathematical Models; Optimization; Systems Health Monitoring*

**20080001409** Warsaw Univ. of Technology, Warsaw, Poland

**Use Of Non-Linear Symptoms in Technical Diagnosis**

Dabrowski, Zbigniew; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 36-41; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

The basic diagnostic problem, that is finding the relationship between the observed signal and the parameters of the object's state, can be resolved with the use of various diagnostic models. The most popular method involving the description of energy distribution is not possible to use in situations when the change of the spectrum's form is not associated with the change of the signal's energy. In such cases the diagnostic measure can be provided by relevantly interpreted non-linear phenomena. In this paper we discuss various aspects of this problem, while particularly accounting for the case when a system, in the initial stage of its life-cycle is linear while the non-linear effects appear and increase in the course of operations.

Author

*Nonlinearity; Mathematical Models; Damping; Vibration Damping; Acoustics*

**20080001410** Poznan Univ. of Technology, Poland

**Energy Method of Diagnosing Technical and Intelligent Bio-Technical Systems & its Applications**

Dobry, Marian W.; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 42-47; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

The publication is concerned with a new diagnostics method of technical and intelligent biological-technical systems in the domains of power distribution and energy flow in the dynamical structure of the systems, which has been elaborated during last years. In this method, a close relationship between the dynamics of the investigated system and energy phenomena was used. The phenomena are strongly dependent from design, manufacturing, time and the way of operation that has influence on the technical condition of the investigated systems. Moreover, they allow to take a decision on liquidation of technical objects. The properties of the method have been shown on several examples of intelligent biological mechanical Human Machine Systems.

Author

*Energy Methods; Biodynamics; Artificial Intelligence; Human-Computer Interface*

**20080001411** Poznan Univ. of Technology, Poland

**Multi-Symptom Condition Monitoring of Critical Mechanical Systems to Design Condition Inference Agent (CIA)**

Cempel, Czeslaw; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 5-10; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

The paper presents the introductory results in application to multi fault condition monitoring of mechanical systems in operation, in particular internal combustion engines. This generalization to multi dimensionality and multi fault condition monitoring is possible by utilizing transformed symptom observation matrix, and by successive application of singular value decomposition (SVD) and based on it principal component analysis (PCA). On this basis one can make full extraction of fault related information taken from symptom observation matrix, which can be created by traditional monitoring technology. Moreover, by SVD/PCA we can create some independent fault measures and indices, and of overall system condition. In

another words, full utilization of SVD/PCA enable us to pass from multi dimensional - non orthogonal symptom space, to orthogonal generalized fault space, of much reduced dimension. This seems to be important, as it can increase the scope and the reliability of condition monitoring of critical system in operation. It enables also to maximize the amount of condition related information, and to redesign the traditional condition monitoring system. At the end of the paper some introductory consideration are presented leading to a design of Condition Inference Agent (CIA), which will enable to infer in real time on condition of critical objects in operation.

Author

*Mechanical Engineering; Complex Systems; Operating Systems (Computers); Inference; Information Theory*

**20080001412** Polish Academy of Sciences, Gdansk, Poland

**Model Based Diagnostics - Today and Tomorrow**

Kicinski, Jan; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 17-22; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

The paper presents author's opinions concerning capabilities and limitations of the model based diagnostics. Present development in computer science and methodology of modelling has increased those capabilities considerably. It is obvious that talking about model based diagnostics assumes possessing not only an advanced theoretical model of the examined object but also models of irregular states and mutual relations between defects and their symptoms. Acquiring sufficiently reliable relations of defect-symptom type is a difficult, and frequently an extremely difficult task. The opinions presented in the paper concern one of the most intriguing phenomena, namely the formation of whirls and whips in slide bearings of a rotating machine. Although those phenomena are being the object of investigation in many research centres all over the world, their physics has not been satisfactorily recognized yet. The paper presents the abilities of computer simulation of the development of oil whirls and whips using the methods characteristic for model based diagnostics. The presented opinions are only considered an example of capabilities of this line of science. Moreover, they were used for formulating conclusions of more general nature.

Author

*Computerized Simulation; Mathematical Models; Rotor Dynamics; Shafts (Machine Elements); Fluid Flow*

**20080001413** Warsaw Univ. of Technology, Warsaw, Poland

**Nonlinear Vibroacoustical Effects in Failure Diagnosis**

Radkowski, Stanislaw; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 11-16; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

This paper presents an analysis of various models of linear and nonlinear acoustic and the assessment of their diagnostic usability. Taking into account the possibility of simulation of classical and non-classical nonlinear effects, we have presented models describing such behavior of waves in solids. There are described the difference between non-classical nonlinearity, and Landau type nonlinearity, for example strain hysteresis, discrete memory and specific dependencies of harmonic amplitudes. The most applications of the nonlinear signals and higher order spectra analyze in diagnostics of the low energy stages of defects are discussed.

Author

*Nonlinearity; Acoustics; Vibration; Failure Analysis; Mathematical Models*

**20080001414** Warsaw Univ. of Technology, Warsaw, Poland

**Diagnostic Models of Industrial Processes**

Koscielny, Jan Maciej; Bartys, Michal; International Journal of COMADEM, Vol. 8, No. 2; April 2005, pp. 23-29; In English; See also [20080001406](#); Copyright; Avail.: Other Sources

An overview and classification of applied modelling approaches in diagnostics of industrial processes is presented in the paper. There are characterized techniques of modelling particularly intended for fault detection and fault isolation. Particular attention was paid on the model practicability aspects. Main features of the models are pointed out. Applicability features of models making use of artificial intelligence and expert knowledge were underlined.

Author

*General Overviews; Mathematical Models; Industries; Fault Detection; Artificial Intelligence*

**20080001415** Chinese Inst. of Engineers, Taipei, Taiwan, Province of China

**Journal of the Chinese Institute of Engineers, Volume 30, No. 3**

Chen, Shi-Shuenn, Editor; Tsai, Hsien-Lung, Editor; Chern, Ming-Jyh, Editor; Lee, Liang-Sun, Editor; Young, Der-Liang, Editor; Pan, Ching-Tsai, Editor; Chen, Jean-Lien; Shieh, Ce-Kuen, Editor; Chao, Ching-Kong, Editor; Chang, Kai, Editor, et al.; May 2007; ISSN 0253-3839; 192 pp.; In English; See also 20080001416 - 20080001435; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Topics covered include: A Potential Field Method for Robot Motion Planning in Unknown Environments; A Filter-Based Self-Similar Trace Synthesizer; Investigation of Meditation Scenario by Quantifying the Complexity Index of EEG; Delay-Dependent Observer-Based Control Design of Uncertain Time-Delay Systems: An LMI Approach; Lighting Design of Headlamp for Adaptive Front-Lighting System; Kinetics of Two-Phase Reaction of o-Phenylene Diamine and Carbon Disulfide Catalyzed by Tetrabutylammonium Hydroxide in the Presence of Potassium Hydroxide; Identification the Microbial Diversity in a Municipal Wastewater Treatment Plant Using Non-Cultured Based Methods; Nano-Fabrication: A Review; Surface Micromachined Capacitive Ultrasonic Transducer for Underwater Imaging; Tracking and Balance Control of Ball and Plate System; Effects of Obstacle Height on the Control of the Body Center of Mass Motion during Obstructed Gait; Failure Life Prediction and Factorial Design of Lead-Free Flip Chip Package; Transient Analysis of Dynamic Crack Propagation in Piezoelectric Materials; Effect of Coating Thickness and Roughness on Water-Repellency and Thermally Induced Voids/cracks in Copper-Coated Optical Fibers Prepared by Electroless Plating Method; A New Query Expansion Method for Document Retrieval Based on the Inference of Fuzzy Rules; Stability Criteria for Neutral Systems with Time-Varying Delays and Nonlinear Uncertainties; Insulation Status Assessment of Cast-Resin Current Transformers Based on Digital Partial Discharge Measurement; Classified Vector Quantization of LPC Parameters; Reused SAD for Partial Search Area in Efficient Three-Step Search Algorithm; and Nonlinear Tracking with Almost Disturbance Decoupling and its Application to Ball and Beam System. Derived from text

*Capacitance; Crack Propagation; Electroencephalography; Failure Analysis; Imaging Techniques; Information Retrieval; Optical Equipment; Piezoelectricity; Temperature Effects; Robot Dynamics; Time Lag*

**20080001416** Chung Chou Inst. of Technology, Changhua, Taiwan, Province of China

**Lighting Design of Headlamp for Adaptive Front-Lighting System**

Liou, Yuan Chang; Wang, Wen-Liang; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 411-422; In English; See also [20080001415](#); Copyright; Avail.: Other Sources

This work develops a projector headlamp optical design to satisfy the regulations of AFS (adaptive front-lighting system) light patterns including Basic, Town, Motorway, and Wet road modes. An adopted aspherical model with 4th order cross-section equation designs a thick projection lens for good focusing results. A proposed polyellipsoid reflector equation with variable axis makes possible a more simple and efficient reflector design. Two plat screen angle design applications, corresponding to two types of AFS light pattern cut-off lines, minimize manufacturing difficulties. Light distribution, qualitatively and quantitatively, meets AFS draft requirements in two passing beam concrete design examples using the H1 and HID bulb, the new proposed asymmetric reflector surface, and two screens.

Author

*Illuminating; Design Analysis; Reflectors; Optical Equipment; Asphericity; Focusing*

**20080001417** Hung Kuang Inst. of Tech., Taichung, Taiwan, Province of China

**Kinetics of Two-Phase Reaction of o-Phenylene Diamine and Carbon Disulfide Catalyzed by Tetrabutylammonium Hydroxide in the Presence of Potassium Hydroxide**

Wang, Maw-Ling; Liu, Biing-Lang; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 423-430; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 86-0402-E-007-011; Copyright; Avail.: Other Sources

The reaction of carbon disulfide and o-phenylene diamine in an alkaline solution of KOH/organic solvent to produce potassium salt of MBI ( $C_6H_4(N)(NH)CS(-)K(+)$ ) ( $ArS(-)K(+)$ ) is catalyzed by the addition of an effective weak-base tetrabutylammonium hydroxide (TBAOH or QOH). The role of KOH is to enhance the reaction rate and the conversion. Water is added to dissolve potassium hydroxide and to provide an environment for the reaction of active intermediate ( $C_6H_4(N)(NH)CS(-)Q(+)$ ,  $ArSQ$ ;  $Q(+)$ :  $(C_4H_9)_{(sub\ 4)}N(+)$ ) and KOH to produce potassium salt of MBI ( $ArSK$ ). Based on the experimental data, a rational mechanism of the two-phase reaction is proposed. A simplified kinetic model is developed to describe the behavior of the reaction. The resistance to mass transfer of the catalyst and the reacting species between two phases can be neglected compared with the rate of reaction in the organic phase. Effects of the reaction conditions, including the amount of carbon disulfide, the amount of o-phenylene diamine, the amount of catalyst, the amount of water, the organic

solvent, the amount of KOH, the agitation speed and temperature on the conversion of o-phenylene diamine are investigated. Potassium hydroxide in an appropriate amount and organic solvent of high dielectric constant are recommended to obtain a large reaction rate.

Author

*Reaction Kinetics; Phenyls; Potassium Hydroxides; Reaction Intermediates; Catalysts; Diamines; Carbon Disulfide*

**20080001418** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

#### **A Filter-Based Self-Similar Trace Synthesizer**

Yao, Chien; Hua, Kai-Lung; Chen, Po-Ning; Chen, Jin-Yuan; Chiang, Tihao; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 379-387; In English; See also [20080001415](#); Copyright; Avail.: Other Sources

Recent empirical studies have shown that modern computer network traffic is much more appropriately modelled by long-range dependent self-similar processes than traditional short-range dependent processes such as Poisson. Thus, if its self-similar nature is not considered in the synthesis of experimental network data, incorrect performance assessments for network systems may result. This raises the need of a self-similar trace synthesizing algorithm with long-range dependence. In this paper, we propose and examine the feasibility of a filter-based method for the synthesis of self-similar network traces. The proposed approach can alleviate the problems encountered by conventional synthesizers, such as random midpoint displacement and Paxson's spectrum fitting, which cannot generate self-similar traces on the fly and may give negative numbers. Additionally, the extended range of self-similarity of the filtered approach can be easily managed by the filter truncation window; therefore, a trace that faithfully matches the measured behavior of true network traffic, where the self-similar nature only lasts beyond a certain range but disappears as the considered aggregated window is much further extended, can be generated.

Author

*Synthesizers; Algorithms; Computer Networks; Displacement; Analogies*

**20080001419** National Taiwan Ocean Univ., Keelung, Taiwan, Province of China

#### **Surface Micromachined Capacitive Ultrasonic Transducer for Underwater Imaging**

Liu, Chia-Hung; Chen, Pei-Tai; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 447-458; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 93-2611-E-019-006; Copyright; Avail.: Other Sources

This study presents the primary design, fabrication process and device measurement of a Capacitive Micromachined Ultrasonic Transducer (CMUT) for underwater acoustic imaging. Theoretical analysis and computer simulations of the CMUT are performed. The CMUT fabrication uses the full surface micromachining techniques of the Micro Electro Mechanical System (MEMS). These techniques are Low Pressure Chemical Vapor Deposition (LPCVD), photolithography, Reactive Ion Etching System (RIE) dry etching, sacrificial layer wet etching, metal thermal evaporation coating and Plasma-Enhanced Chemical Vapor Deposition (PECVD). Several important issues regarding fabrication are discussed. The measured input impedance of the CMUT is in agreement with the theoretical prediction. The received signal has a 35 dB signal-to-noise ratio indicating that practical applications of the immersion CMUT are feasible and that the radiation pattern measurement of the CMUT array has good beamforming characteristics for underwater imaging.

Author

*Underwater Acoustics; Imaging Techniques; Micromachining; Ultrasonics; Transducers; Computerized Simulation; Acoustic Imaging; Antenna Radiation Patterns; Capacitance*

**20080001420** National Yunlin Univ. of Science and Technology, Yunlin, Taiwan, Province of China

#### **A Potential Field Method for Robot Motion Planning in Unknown Environments**

Lai, Li-Chun; Wu, Chia-Ju; Shiue, Yeong-Long; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 369-377; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC93-2213-E-224-001; NSC93-2218-E-224-020; Copyright; Avail.: Other Sources

Based on a potential field function, a method is proposed to navigate a mobile robot from a given initial configuration to a desired final configuration in an unknown environment filled with obstacles. To determine its configuration accurately, the robot is equipped with an electronic compass and two optical encoders for dead-reckoning, an ultrasonic module for self-localization, and a time-of-flight (TOF) laser range finder for environment recognition. From the readings of sensors at every sampling instant, the proposed method will determine the heading direction of the robot. Then the robot is driven to an intermediate configuration along the heading direction. The navigation procedure will be iterated until a collision-free path



between the initial and the final configurations is found. To show the feasibility and validity of the proposed method, simulation and experimental results are included for illustration.

Author

*Robot Dynamics; Potential Fields; Dead Reckoning; Trajectory Control; Robots; Position (Location); Laser Range Finders*

**20080001422** National Formosa Univ., Yunlin, Taiwan, Province of China

**Nonlinear Tracking with Almost Disturbance Decoupling and its Application to Ball and Beam System**

Lin, Yen-Feng; Chen, Ming-Huang; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 545-551; In English; See also [20080001415](#); Copyright; Avail.: Other Sources

The almost disturbance decoupling and trajectory tracking of nonlinear control systems, using an observer-based feedback linearization control, is developed. The main contribution of this study is to construct a controller, under appropriate conditions, such that the resulting closed-loop system enjoys the following characteristics: input-to-state stability with respect to disturbance inputs and almost disturbance decoupling for any initial condition and bounded tracking signal. The proposed method is illustrated by application to a real experiment of the well-known ball and beam system. Because not all of the state variables of the ball and beam system are available, a nonlinear state observer is employed to estimate the state variables. The experimental results show that our proposed approach has achieved the almost disturbance decoupling performance perfectly.

Author

*Trajectory Control; Nonlinear Systems; Decoupling; Feedback Control; Controllers*

**20080001423** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**Insulation Status Assessment of Cast-Resin Current Transformers Based on Digital Partial Discharge Measurement**

Lin, Yu-Hsun; Wu, Ruay-Nan; Chung, I-Hua; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 523-529; In English; See also [20080001415](#); Copyright; Avail.: Other Sources

Three cast-resin current transformers with different PD inception voltages of 43kV, 24kV and 12kV, respectively, are used in accelerated aging tests during which PD information is detected and measured. Lastly, the real measurement results of two cast-resin current transformers are used to examine the feasibility of the proposed determination rules. Our study shows that the slope of the average discharge amount's development trend is more suitable for insulation status determination than other parameters, and said slope's accuracy and practicality is valuable for continuous research in insulation aging.

Author

*Insulation; Aging (Materials); Accelerated Life Tests; Electric Potential*

**20080001424** National Taiwan Normal Univ., Taipei, Taiwan, Province of China

**Reused SAD for Partial Search Area in Efficient Three-Step Search Algorithm**

Su, Chung-Yen; Hsu, Yi-Pin; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 537-543; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 93-2213-E-003-009; Copyright; Avail.: Other Sources

In real-time applications, three-step search (TSS) is always preferred because it has a regular search pattern. However, it may lose its performance in coding video sequences with small motion. To overcome this drawback, some fast search algorithms are proposed, for example, new three-step search (NTSS) and efficient three step search (ETSS). In this paper, a more effective fast search algorithm called region-split three-step search (RSTSS) is proposed. In addition to the feature of a regular search pattern, the RSTSS splits the search region into four sub-regions and enters only one of the sub-regions to search for the best motion vector. The main idea used in the RSTSS is to reuse the sum of absolute difference (SAD) values of the 9 points on a 9 x 9 grid. Experimental results show that the RSTSS performs better than the ETSS in terms of the number of checking points. It can reduce the number of checking points nearly 19% on average and sacrifices only a little mean squared error. Most of all, the RSTSS retains a regular searching pattern that is suitable for hardware implementation.

Author

*Algorithms; Sequencing; Mean Square Values; Real Time Operation*

**20080001425** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**A New Query Expansion Method for Document Retrieval Based on the Inference of Fuzzy Rules**

Chang, Yu-Chuan; Chen, Shyi-Ming; Liau, Churn-Jung; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 511-515; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC92-2213-E-011-074; Copyright; Avail.: Other Sources

Automatic query expansion based on user relevance feedback techniques can improve the performance of document

retrieval systems. In this paper, we present a new query expansion method based on the inference of fuzzy rules and user relevance feedback techniques to deal with document retrieval. The proposed method uses membership functions and fuzzy rules to infer relevant degrees of expansion terms and puts the expansion terms with larger relevant degrees into the original user's query. Then, the system calculates the degree of similarity of each document with respect to the expanded user's query. The proposed method gets a higher average precision rate and a higher average recall rate than the existing methods for document retrieval.

Author

*Information Retrieval; Inference; Feedback; Query Languages*

**20080001426** National Kinmen Inst. of Tech., Kinmen, Taiwan, Province of China

**Delay-Dependent Observer-Based Control Design of Uncertain Time-Delay Systems: An LMI Approach**

Chen, Jenq-Der; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 401-409; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 94-2213-E-507-002; Copyright; Avail.: Other Sources

In this paper, the problem of delay-dependent observer-based controls for a class of uncertain systems with time delay is considered. The linear matrix inequality (LMI) optimization approach is used to design the robust controls and the allowable maximal perturbed bound is given. The control and observer gains are given from the LMI feasible solutions. Based on the results of this paper, the constraint of matrix equality is not necessary for designing observer-based controls. Finally, an example is provided to show the usefulness of the proposed method.

Author

*Uncertain Systems; Inequalities; Time Lag; Optimization*

**20080001427** National Chengchi Univ., Taipei, Taiwan, Province of China

**Tracking and Balance Control of Ball and Plate System**

Ker, Cheng-Chang; Lin, Chin E.; Wang, Rong Tyai; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 459-470; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC93-2218-E006-016; Copyright; Avail.: Other Sources

An extension of the traditional ball and beam system into a ball and plate system is constructed using two magnetic suspension actuators for two degree of freedom control. System characteristics of the mathematical model with control configuration are developed. For control performance, a single-chip microprocessor, serving as control kernel with basic electronic components, is designed and implemented. According to the backstepping control design procedure, the proposed controller is fabricated and tested. Several scenarios of dynamic operation, including oscillatory stabilization and circular trajectory tracking are tested to verify the system performance and capability.

Author

*Degrees of Freedom; Controllers; Actuators; Magnetic Suspension; Microprocessors*

**20080001428** I-Shou Univ., Kaohsiung, Taiwan, Province of China

**Stability Criteria for Neutral Systems with Time-Varying Delays and Nonlinear Uncertainties**

Lien, Chang-Hua; Yu, Ker-Wei; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 517-522; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 94-2213-E-214-021; Copyright; Avail.: Other Sources

The asymptotic stability problem for a class of neutral systems with time-varying delays and nonlinear uncertainties is investigated in this paper. LMI-based delay-dependent criteria are proposed to guarantee the asymptotic stability of the considered systems. New Lyapunov-Krasovskii functional and Leibniz-Newton formulae are used to find the delay-dependent stability results. Finally, some numerical examples are illustrated to show the improved results from using this method.

Author

*Variations; Uncertain Systems; Asymptotic Properties; Nonlinearity*

**20080001429** National Chung Hsing Univ., Taichung, Taiwan, Province of China

**Effect of Coating Thickness and Roughness on Water-Repellency and Thermally Induced Voids/cracks in Copper-Coated Optical Fibers Prepared by Electroless Plating Method**

Chu, Rong-Shian; Shiue, Sham-Tsong; Yang, Tsong-Jen; Wu, Tung-Chuan; Lin, Hung-Yi; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 503-510; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 94-2215-E-005-002; Copyright; Avail.: Other Sources

The effect of coating thickness and roughness on water-repellency and thermally induced voids/cracks in copper-coated

optical fibers is investigated. Seven samples of copper-coated optical fibers with identical fiber length but different coating thicknesses were prepared using electroless plating. The thicknesses of copper coatings were 62, 89, 127, 154, 165, 206, and 251 nm, respectively. Atomic force microscope measurement reveals that the roughness of copper coating increases when increasing the coating thickness. It is found that if the coating thickness is less than 89 nm, the water contact angle slightly increases with increasing the coating thickness, while fewer thermally induced voids/cracks are found in copper coatings. If the coating thickness is in the range of 89 to 251 nm, the water contact angle decreases when increasing the coating thickness, while the number of thermally induced voids/cracks increases when increasing the coating thickness. To get copper-coated optical fibers with high water-repellency and few thermally induced voids/cracks, the surface roughness of copper coatings should be diminished.

Author

*Optical Fibers; Coatings; Temperature Effects; Surface Roughness; Optical Equipment; Metal Coatings; Electroless Deposition*

**20080001430** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

**Investigation of Meditation Scenario by Quantifying the Complexity Index of EEG**

Lo, Pei-Chen; Huang, Hsuan-Yung; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 389-400; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC91-2213-E-009-069; UST-92B-711; Copyright; Avail.: Other Sources

A practitioner in true meditation should already transcend the physiological, mental, subconscious, and Alaya state, and eventually attain the spiritual realm. The scientific approach to the scope of Zen meditation provides insight into the mechanism in addition to the vague sketch of meditation sensation and its multiform benefits to human beings. In meditation research, it is difficult to access changes of the consciousness state during meditation. Meditators once transcending the physiological and mental state cannot convey information outside. As a consequence, quantitative results together with post-experimental, subjective narration may provide us with a glimpse of the meditation scenario. This paper mainly reports our preliminary results of quantifying the long-term brain waves, recorded by the electroencephalogram (EEG), for both experimental (meditators) and control groups. Based on the nonlinear dynamic analysis of multi-channel EEG signals, we found that brain dynamics exhibited high  $g(\text{dJIP EEG})$  in deep meditation. Three different meditation scenarios have been identified from the running 8 (averaged complexity index) chart. Spatial characteristics also deviate from that of the control group. This observation was summarized from the results of analyzing the meditation EEG's collected from 17 Zen-Buddhist practitioners and 16 control subjects.

Author

*Electroencephalography; Nonlinearity; Mental Health; Consciousness*

**20080001434** Kao Yuan Univ., Kaohsiung, Taiwan, Province of China

**Classified Vector Quantization of LPC Parameters**

Wang, Mu-Liang; Yang, Jar-Ferr; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 531-536; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC-95-2221-E-244-008; Copyright; Avail.: Other Sources

To achieve high coding efficiency, modern speech coders adopt hybrid coding approaches, which utilize different coding mechanisms for various classified speech segments. With known voiced/unvoiced detection, in this paper, a classified LPC quantization (CLPQ) scheme is presented to effectively encode line spectral frequencies (LSF). The proposed CLPQ scheme improves the performance of the classified LSF vector quantizer, which adopts two LSF codebooks derived separately from voiced and unvoiced speech frames. With an objective spectral distortion measure, the CLPQ scheme successfully reduces the bit rate by about 1 bit/frame. Many classified LSF quantizers with different codebook structures and bit rates were evaluated. It would be helpful to design a classified LSF quantizer, which arrives at a compromise between distortion, bit rate and computational complexity.

Author

*Vector Quantization; Coding; Speech; Distortion; Voice Data Processing*

**20080001435** National Taiwan Univ., Taipei, Taiwan, Province of China

**Transient Analysis of Dynamic Crack Propagation in Piezoelectric Materials**

Chen, Xi-Hong; Ing, Yi-Shyong; Ma, Chien-Ching; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 491-502; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC 92-2212-E-002-065; Copyright; Avail.: Other Sources

In this paper, the transient analysis of semi-infinite propagating cracks in piezoelectric materials subjected to dynamic

anti-plane concentrated body force is investigated. The crack surface is assumed to be covered with an infinitesimally thin, perfectly conducting electrode that is grounded. In analyzing this problem, it has characteristic lengths and a direct attempt towards solving this problem by transform and Wiener-Hopf techniques (Noble, 1958) is not applicable. In order to solve this problem, a new fundamental solution for propagating cracks in piezoelectric materials is first established and the transient response of the propagating crack is obtained by superposition of the fundamental solution in the Laplace transform domain. The fundamental solution to be used is the responses of applying exponentially distributed traction in the Laplace transform domain on the propagating crack surface. Taking into account the quasi-static approximation, exact analytical transient solutions for the dynamic stress intensity factor and the dynamic electric displacement intensity factor are obtained by using the Cagnard-de Hoop method (Cagnard, 1939; de Hoop, 1960) of Laplace inversion and are expressed in explicit forms. Numerical calculations of dynamic intensity factors are evaluated and the results are discussed in detail. The transient solutions for stationary cracks have been shown to approach the corresponding static values after the shear wave of the piezoelectric material has passed the crack tip.

Author

*Crack Propagation; Dynamic Loads; Piezoelectricity; Transient Response; Stress Analysis*

**20080001454** NASA Glenn Research Center, Cleveland, OH, USA

**Propulsion Controls and Diagnostics Research at NASA Glenn Research Center**

Garg, Sanjay; October 2007; 32 pp.; In English; 43rd Joint Propulsion Conference, 8-11 Jul. 2007, Cincinnati, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 732759.03.01.02.17

Report No.(s): NASA/TM-2007-215028; AIAA Paper-2007-5713; E-16221; No Copyright; Avail.: CASI: [A03](#), Hardcopy ONLINE: <http://hdl.handle.net/2060/20080001454>

With the increased emphasis on aircraft safety, enhanced performance and affordability, and the need to reduce the environmental impact of aircraft, there are many new challenges being faced by the designers of aircraft propulsion systems. Also the propulsion systems required to enable the National Aeronautics and Space Administration (NASA) Vision for Space Exploration in an affordable manner will need to have high reliability, safety and autonomous operation capability. The Controls and Dynamics Branch (CDB) at NASA Glenn Research Center (GRC) in Cleveland, Ohio, is leading and participating in various projects in partnership with other organizations within GRC and across NASA, the U.S. aerospace industry, and academia to develop advanced controls and health management technologies that will help meet these challenges through the concept of Intelligent Propulsion Systems. This paper describes the current activities of the CDB under the NASA Aeronautics Research and Exploration Systems Missions. The programmatic structure of the CDB activities is described along with a brief overview of each of the CDB tasks including research objectives, technical challenges, and recent accomplishments. These tasks include active control of propulsion system components, intelligent propulsion diagnostics and control for reliable fault identification and accommodation, distributed engine control, and investigations into unsteady propulsion systems.

Author

*Control Theory; Active Control; Fault Detection; Propulsion System Configurations; Distributed Parameter Systems; Engine Control*

**20080001496** Defence Research and Development Suffield, Suffield, Alberta Canada

**Assessment of a Solid Phase Matrix for the Neutralization and Real-Time PCR Detection of Bacillus anthracis**

Bader, Douglas E; Fisher, Glen R; Stratilo, Chad W; Dec 2006; 31 pp.; In English

Report No.(s): AD-A472833; DRDC-S-TM-2006-200; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A commercially available, solid-phase DNA binding matrix (FTA (Trademark) cards) was evaluated for its ability to neutralize live Bacillus anthracis and entrap nucleic acid for genetic analysis using real-time polymerase chain reaction (PCR) assays. Cell culture analysis of FTA (Trademark) cards seeded with live B. anthracis indicated that FTA (Trademark) cards neutralized live B. anthracis but at low concentrations. Therefore, FTA (Trademark) cards spotted with samples containing, or suspected of containing live B. anthracis should be considered potentially infectious. PCR analysis of FTA (Trademark) cards seeded with live B. anthracis using assays designed to detect B. anthracis plasmidic gene targets, resulted in detection below the live agent 'neutralization' concentration. This may be due in part to a number of factors including multiple plasmids present per colony forming unit (cfu), multiple cells per cfu (cellular clumping), and/or, additional gene target contributions from non-viable cells. PCR reaction solutions exposed to discs seeded with low concentrations of live B. anthracis were found to be culture-negative and thus may be safe to handle under non-containment conditions, but additional studies would be required to determine the level of safety at higher concentrations. Although FTA (Trademark) cards exhibited limited

neutralization capacity for live B. anthracis, they still may be of value for field and lab-based applications as BT/BW agent sample processing, archiving, transport and analysis media, due to their ability to protect and preserve genetic material under storage or transport conditions where cryopreservation (refrigeration or freezing) may not be possible and, therefore, are of continued interest.

DTIC

*Bacillus; Deoxyribonucleic Acid; Detection; Real Time Operation; Solid Phases*

**20080001609** Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium

**Increasing Accuracy in Super-Resolution PIV**

Theunissen, R; Stitou, A; Riethmuller, M L; Apr 2005; 19 pp.; In English

Report No.(s): AD-A471496; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Particle Image Velocimetry; Velocity Distribution; Flow Distribution*

**20080001659** Yokohama National Univ., Japan

**Study of Cryogenic Complex Plasma**

Ishihara, Osamu; Nakamura, Yoshiharu; Shindo, Masako; Kijima, Chikara; Apr 26, 2007; 9 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0033

Report No.(s): AD-A473129; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473129>

This Report describes the investigation entitled by 'Study of Cryogenic Complex Plasma.' The research has been carried out at Yokohama National University. Our overall goal is to study the cryogenic complex plasma experimentally and theoretically and to reveal novel natures of cryogenic complex plasma produced by a stable discharge above or in superfluid liquid helium. Two Dewar bottles, YD-1 (Yokohama Dewar 1) and YD-2 (Yokohama Dewar 2), accommodate cryogenic plasma with dust particles. The cryogenic rf plasma and complex plasma was produced in a glass tube in YD-1, although cryogenic complex plasma has not been produced yet. The cryogenic plasma has been produced in the vapor of the liquid helium in YD-2 device, but the cryogenic complex plasma has not been clearly observed in YD-2 yet. The linear device YCOPEX (Yokohama Complex Plasma Experiment) has been assembled to study the fundamental physics of room temperature complex plasma which supports the diagnostics of complex plasma to be applied to YD-1 and YD-2.

DTIC

*Cryogenics; Plasma Generators; Plasmas (Physics)*

**20080001861** Defence Research and Development Canada, Toronto, Ontario Canada

**Use of the Dismounted Soldier Simulator to Corroborate NVG Studies in a Field Setting**

Ho, Ghee; Frim, John; Jun 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473300; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Night Vision; Simulators; Virtual Reality*

**20080001864** Birmingham Univ., UK

**Experimental Studies in a Reconfigurable C4 Test-bed for Network Enabled Capability**

Stanton, N A; Walker, G H; Salmon, P M; Gulliver, S; Jenkins, D; Ladva, Darshna; Rafferty, Laura; Young, M S; Watts, S; Baber, C; Jun 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Command and Control; Test Stands*

**20080001916** CAE Professional Services, Ottawa, Ontario Canada

**Applying Simulation to Study Human Performance Impacts of Evolutionary and Revolutionary Changes to Armoured Vehicle Design**

Espenant, Mark; Apr 2006; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473367; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Human Factors Engineering; Human Performance; Military Vehicles; Simulation*

**20080002275** NASA Glenn Research Center, Cleveland, OH, USA

**Seal Technology**

Steinetz, Bruce M.; October 2005; 54 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 22-714-92-56; Copyright; Avail.: Other Sources

Seals are required to fulfill critical needs in meeting the ever-increasing system-performance requirements of modern machinery. Approaching a seal design, one has a wide range of available seal choices. This chapter aids the practicing engineer in making an initial seal selection and provides current reference material to aid in the final design and application. This chapter provides design insight and application for both static and dynamic seals. Static seals reviewed include gaskets, O-rings, and selected packings. Dynamic seals reviewed include mechanical face, labyrinth, honeycomb, and brush seals. For each of these seals, typical configurations, materials, and applications are covered. Where applicable, seal flow models are presented.

Derived from text

*Brush Seals; Gaskets; Labyrinth Seals; O Ring Seals; Seals (Stoppers)*

**20080002369** Academy of Health Sciences (Army), Fort Sam Houston, TX USA

**Military Standard: Sanitary Standards for Butter (and Related Products) Plants**

Jun 5, 1980; 34 pp.; In English

Report No.(s): AD-A473533; MIL-STD-1482C; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473533>

This standard establishes the general sanitary requirements for butter and related products plants. This standard is primarily intended to insure clean wholesome food products that are free from chemical, microbiological, and physical contaminants and to prevent the transmission of foodborne disease to members of the Armed Forces.

DTIC

*Contaminants; Industrial Plants*

**20080002405** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Streamwise Vorticity Effects in a Curved Diffuser with Slot Jet Flow Control (Preprint)**

Bailie, S T; Car, David; Estevadeordal, Jordi; Jun 2006; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473587; AFRL-PR-WP-TP-2007-239; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473587>

A slot jet is used to increase the diffusion level of a curved, diffusing wind tunnel passage. The passage entrance coincides with the tunnel throat, which has respective Mach and Reynolds numbers of 0.7 and 187000 (based on throat height) and jet Reynolds numbers ranging from 10000 to 22000. Each of four presented configurations uses linear slot jet flow control at the same relative location. Three configurations include co- or counter-rotating vortex generator (VG) fins of varying heights upstream of the slot jet, while the other configuration has no VGs. The configurations are tested for varying flow control input and evaluated primarily on the basis of passage exit total pressure surveys. At baseline conditions (minimum slot jet flow), the shorter VG designs were found to provide some diffusion enhancement and loss reduction compared to the non-VG configuration, whereas the tall counter-rotating VGs exhibit an increase in loss. With the addition of slot jet flow, all configurations showed an initial decline followed by a net increase in performance of similar magnitude, with choked slot jet flows tending to lead to flow instabilities. Upon further increases in slot jet flow, all configurations eventually achieved a stable flow pattern. A noteworthy change in the flow pattern, with substantially improved uniformity, is documented near 6% flow control input and will be the subject of more detailed investigation.

DTIC

*Jet Flow; Slots; Vortex Generators; Vorticity*

**20080002650** Tennessee Technological Univ., Cookeville, TN USA

**Time-Reversal Based Range Extension Technique for Ultra-wideband (UWB) Sensors and Applications in Tactical Communications and Networking**

Qiu, Robert C; Guo, Nan T; Zhang, Qiang J; Zhou, Chenming J; Hu, Zhen E; Zhang, Peng P; Singh, Dalwinder; Cooke, Corey; Oct 16, 2007; 149 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-07-1-0529

Report No.(s): AD-A473848; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This technical report (quarterly) details the work for Office of Naval Research (ONR) by Tennessee Tech. The goal of this

project -- jointly funded by ONR, NSF, and ARO -- is to build a general purpose testbed with time reversal capability at the transmitter side. The envisioned application is for UWB sensors and tactical communications in RF harsh environments where multipath is rich and can be exploited through the use of time reversal. The report summarizes the results for both theoretical research and experimental testbed.

DTIC

*Broadband*

## 32

### COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 *Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see 03 *Air Transportation and Safety*; and 16 *Space Transportation and Safety*.

**20080000391** Research Support Instruments, Inc., Lanham, MD USA

#### **Laboratory Implementation of an Adaptive Thresholding System for Free-Space Optical Communication Receivers with Signal Dependent Noise**

Burris, H R; Moore, C I; Swingen, L A; Wasiczko, L M; Mahon, R; Stell, M F; Suite, M R; Rabinovich, W S; Murphy, J L; Gilbreath, G C; Scharpf, W J; Jan 2005; 21 pp.; In English

Report No.(s): AD-A472203; NRL-05-1226-2649; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472203>

The optimum detection threshold for optical communication receivers with large signal-dependant noise components can be derived from a Bayes' Likelihood Ratio Test; however, the bit level statistics must be known a priori. In free-space communication systems, atmospheric conditions cause variations in optical transmission and subsequently in the bit level means and variances. These bit parameters must be tracked, estimated, and predicted, in order to update the detection threshold at a rate greater than the frequency of atmospheric changes. A laboratory implementation of an adaptive thresholding system is being implemented at the U.S. Naval Research Laboratory's Chesapeake Bay Free-space Lasercom Testbed. Early results of experiments underway and initial design of the system will be presented.

DTIC

*Free-Space Optical Communication; Optical Communication; Receivers*

**20080000404** Naval Research Lab., Washington, DC USA

#### **Overview of NRL's Maritime Laser Communication Test Facility**

Moore, Christopher I; Burris, Harris R; Rabinovich, William S; Wasiczko, Linda; Suite, Michele R; Swingen, Lee A; Mahon, Rita; Stell, Mena F; Gilbreath, G C; Scharpf, William J; Jan 2005; 13 pp.; In English

Report No.(s): AD-A472235; NRL RN-05-1226-2651; XB-NRL/FR/8120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472235>

NRL has established a 20 mile round trip laser communication test facility across the Chesapeake Bay for investigating lasercomm performance in a maritime environment. Experiments at this facility have successfully demonstrated links at data rates up to 2.5 Gbps and at lower rates in light rain and fog. This facility is currently being upgraded to allow long term monitoring of a one-way 10 mile link across the Bay. Parameters monitored will include BER, turbulence conditions, atmospheric transmission, and meteorological conditions. A summary of past results, the design/status of the upgrade to the test facility, and recent results will be presented.

DTIC

*Marine Environments; Optical Communication; Test Facilities*

**20080000409** NATO Consultation, Command, and Control Agency, Brussels, Belgium

#### **Observations in the Dissemination of Intelligence Surveillance and Reconnaissance (ISR) Data and Information within a Coalition Environment**

Mahaffey, John L; Apr 2005; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472243>

No abstract available

*Intelligence; Military Operations; Reconnaissance; Surveillance*

**2008000578** Naval Research Lab., Washington, DC USA

**Special Information on High-Frequency Radar. Part 15**

Headrick, J M; Headrick, W C; Hudnall, J M; Thomason, J F; Jun 1971; 101 pp.; In English

Contract(s)/Grant(s): NRL-MR-2265

Report No.(s): AD-A472346; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A good real time description of the ionospheric transmission path will be essential for effective operational use of the radar. The major purpose of this experiment is to explore analysis techniques that use echoes from the earth surface as a base to form a transmission description and thus to optimize radar operation and to evaluate radar performance. The essential step herein is to determine how to provide an adequate description of the transmission medium. The extent to which this description can be accomplished with only radar outputs will be examined and the necessary auxiliary ionospheric describers will be defined.

DTIC

*High Frequencies; Radar Equipment; Transmittance*

**2008000612** Tennessee Technological Univ., Cookeville, TN USA

**Time-Reversal Based Range Extension Technique for Ultra-Wideband (UWB) Sensors and Applications in Tactical Communications and Networking**

Qiu, Robert C; Guo, Nan T; Zhang, Qiang J; Zhou, Chenming J; Hu, Zhen E; Zhang, Peng P; Singh, Dalwinder; Cooke, Corey; Jul 16, 2007; 64 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-07-1-0529

Report No.(s): AD-A472443; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This technical report (quarterly) details the work for Office of Naval Research (ONR) by Tennessee Tech. The goal of this project - jointly funded by ONR, NSF, and ARO - is to build a general purpose testbed with time reversal capability at the transmitter side. The envisioned application is for UWB sensors and tactical communications in RF harsh environments where multipath is rich and can be exploited through the use of time reversal. The report summarizes the results for each of three major tasks. The central task of this project is to address unique (rich) multipath problems faced with system design and implementation. The 1G testbed is working over the air and almost finished - except for an issue related to the high-speed interface between the FPGA and A/D converter. Currently, the 2G testbed is ongoing and very unstable - we are integrating the transmitter system in our Lab. More details are expected to be reported in the next report.

DTIC

*Broadband; Networks*

**2008000806** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**The Requirements Process for the Army Multi-Mission Radar and the Marine Corps Multi-Role Radar System**

Jolliffe, Richard B; Meling, John E; James, Harold C; Greene, Andrew D; Witter, Nathan R; Dehoux, Breon E; Slaughter, Douglas W; Chambers, Caryn M; Bobbio, Jaime A; Chang, Wei K; Tran, Menh Q; Johnson, Meredith H; Dec 14, 2006; 29 pp.; In English

Report No.(s): AD-A472320; ODIGAD-D-2007-033; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report discusses the processes the Army and the Marine Corps used to generate requirements for the Multi-Mission Radar and the Multi-Role Radar System. We performed this audit in response to allegations made to the DoD Hotline. The allegations concerned the processes the Army and the Marine Corps used to generate requirements for the Multi-Mission Radar and the Multi-Role Radar System which are both multiple-mission radar systems. This report addresses the four allegations made concerning: (1) defining threat requirements and the urgent need for the radars; (2) performing an adequate analysis of alternatives for the radars, to include an assessment of current radar systems, upgrades to current radar systems, and planned radar systems of the other Services; (3) considering combat effectiveness and suitability factors when defining radar requirements; and (4) threatening improper personnel actions against staff wanting to discuss alternative means of meeting radar requirements.

DTIC

*Combat; Radar Equipment*

**2008001161** Library of Congress, Washington, DC USA

**Homeland Security: Defending U.S. Airspace**

Bolkcom, Christopher; Sep 12, 2003; 7 pp.; In English

Report No.(s): AD-A472834; CRS-RS21394; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The September 11th attacks have drawn attention to U.S. air defense. Protecting U.S. airspace may require improvements



in detecting enemy aircraft and cruise missiles, making decisions on how to address these threats, and intercepting them. A number of options exist in each of these areas, and they must be evaluated. The Department of Defense will likely consider a variety of issues in their evaluation, including expediency, cost, and minimizing conflicts with civilian air traffic. This report will be updated.

DTIC

*Air Defense; Airspace; Antimissile Defense; Command and Control; Cruise Missiles; Missile Defense; Security; United States*

**20080001162** Library of Congress, Washington, DC USA

**Homeland Security: Defending U.S. Airspace**

Bolkcom, Christopher; Feb 11, 2005; 7 pp.; In English

Report No.(s): AD-A472835; CRS-RS21394; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The September 11th attacks drew attention to U.S. air defense, and the 9/11 Commission Report recommended that Congress regularly assess the ability of Northern Command to defend the USA against military threats. Protecting U.S. airspace may require improvements in detecting aircraft and cruise missiles, making quick operational decisions on how to address these threats, and intercepting them. A number of options exist in each of these areas, and they must be evaluated. The Department of Defense must consider a variety of issues in their evaluation, including expediency, cost, and minimizing conflicts with civilian aviation. This report will be updated.

DTIC

*Air Defense; Airspace; Antimissile Defense; Command and Control; Cruise Missiles; Missile Defense; Security; United States*

**20080001163** Library of Congress, Washington, DC USA

**Homeland Security: Defending U.S. Airspace**

Bolkcom, Christopher; Oct 13, 2004; 7 pp.; In English

Report No.(s): AD-A472836; CRS-RS21394; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The September 11th attacks have drawn attention to U.S. air defense, and the 9/11 Commission Report has specifically recommended that Congress regularly assess the ability of Northern Command to defend the USA against military threats. Protecting U.S. airspace may require improvements in detecting aircraft and cruise missiles, making quick operational decisions on how to address these threats, and intercepting them. A number of options exist in each of these areas, and they must be evaluated. The Department of Defense will likely consider a variety of issues in their evaluation, including expediency, cost, and minimizing conflicts with civilian aviation. This report will be updated.

DTIC

*Air Defense; Airspace; Antimissile Defense; Command and Control; Cruise Missiles; Missile Defense; Security; United States*

**20080001238** Defence Research and Development Canada, Toronto, Ontario Canada

**Development and Evaluation of an Intuitive Operations Planning Process**

Martin, Lora B; Bandali, Farahnaz; Rehak, Lisa; Vokac, Robert; Lamoureux, Tab; Mar 2006; 144 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7711-047943/001/TOR

Report No.(s): AD-A473012; DRDC-CR-2006-076; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work represents the fourth phase of a project investigating the Canadian Forces (CF) Operational Planning Process (OPP) and an alternative planning process based on intuitive decision making. This is in support of a larger project, Project Minerva, focused on reexamining Command and Control (C2), specifically the CF OPP, in the Land Force in light of the implementation of digitized C2 systems. The CF OPP represents an analytic decision making process in which 1) multiple solutions to the problem must be evaluated and the best selected, and 2) evaluation of solution alternatives must be performed through exhaustive factor-by-factor comparison. Research in the cognitive sciences has suggested that a large portion of human decision making is conducted intuitively; i.e. by less formal, non-analytic processes. Thus, there may be a mismatch between the OPP as laid out in doctrine and taught at training and education institutions within the CF, and the planning process as practiced by command teams in more operational settings, especially at the Brigade level and below. Specifically, the current work includes the development of an alternative planning process based on intuitive decision making (referred to as the Intuitive Operations Planning Process or IOPP), the development of a training course for the IOPP, and an evaluation of the effectiveness of the IOPP compared to the existing CF OPP. The IOPP exhibits the best characteristics of other intuitive planning models (Kievenaar, 1997; Schmitt & Klein, 1999; Thunholm, 2005; Whitehurst, 2002) and incorporates findings from previous work investigating application of the OPP in the CF (Bruyn et al., 2005), while maintaining a large amount of

the terminology, outputs generated and formal staff briefings used in the OPP in order to promote level of acceptance by CF practitioners and face validity of the IOPP.

DTIC

*Command and Control; Military Operations*

**20080001449** NASA Glenn Research Center, Cleveland, OH, USA

**Array Phase Shifters: Theory and Technology**

Romanofsky, Robert R.; October 2007; 32 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 439432.04.04.01

Report No.(s): NASA/TM-2007-214906; E-16067; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001449>

While there are a myriad of applications for microwave phase shifters in instrumentation and metrology, power combining, amplifier linearization, and so on, the most prevalent use is in scanning phased-array antennas. And while this market continues to be dominated by military radar and tracking platforms, many commercial applications have emerged in the past decade or so. These new and potential applications span low-Earth-orbit (LEO) communications satellite constellations and collision warning radar, an aspect of the Intelligent Vehicle Highway System or Automated Highway System. In any case, the phase shifters represent a considerable portion of the overall antenna cost, with some estimates approaching 40 percent for receive arrays. Ferrite phase shifters continue to be the workhorse in military-phased arrays, and while there have been advances in thin film ferrite devices, the review of this device technology in the previous edition of this book is still highly relevant. This chapter will focus on three types of phase shifters that have matured in the past decade: GaAs MESFET monolithic microwave integrated circuit (MMIC), micro-electromechanical systems (MEMS), and thin film ferroelectric-based devices. A brief review of some novel devices including thin film ferrite phase shifters and superconducting switches for phase shifter applications will be provided. Finally, the effects of modulo 2 phase shift limitations, phase errors, and transient response on bit error rate degradation will be considered.

Author

*Antenna Arrays; Phase Shift Circuits; Microwave Circuits; Phase Shift; Integrated Circuits; Microelectromechanical Systems; Field Effect Transistors; Superconductivity*

**20080001523** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Real-Time Fusion of Image and Inertial Sensors for Navigation**

Fletcher, J; Veth, M; Raquet, J; Jan 2007; 13 pp.; In English

Report No.(s): AD-A473018; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As evidenced by many biological systems, the fusion of optical and inertial sensors represents an attractive method for passive navigation. In our previous work, a rigorous theory for optical and inertial fusion was developed for precision navigation applications. The theory was based on a statistical transformation of the feature space based on inertial sensor measurements. The transformation effectively constrained the feature correspondence search to a given level of a priori statistical uncertainty. When integrated into a navigation system, the fused system demonstrated performance in indoor environments which were comparable to that of GPS-aided systems. In order to improve feature tracking performance, a robust feature transformation algorithm 'Lowe's SIFT' was chosen. The SIFT features are ideal for navigation applications in that they are invariant to scale, rotation, and illumination. Unfortunately, there exists a correlation between feature complexity and computer processing time. This limits the effectiveness of robust feature extraction algorithms for real-time applications using traditional microprocessor architectures. While recent advances in computer technology have made image processing more commonplace, the amount of information that can be processed is still limited by the power and speed of the CPU. In this paper, a new theory which exploits the highly parallel nature of General Programmable Graphical Processing Units 'GPGPU' is developed which supports deeply integrated optical and inertial sensors for real-time navigation. Recent advances in GPGPU technology have made realtime, image-aided navigation a reality. Our approach leverages the existing OpenVIDIA core GPGPU library and commercially available computer hardware to solve the image and inertial fusion problem. The open-source libraries are extended to include the statistical featur

DTIC

*Inertial Navigation; Real Time Operation*

**20080001619** Defence Research and Development Canada, Toronto, Ontario Canada

**Mission Command: Elasticity, Equilibrium, Culture, and Intent**

Stewart, Keith G; Nov 2006; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472967; DRDC-TORONTO-TR-2006-254; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472967>

Mission command is based upon the exercise of local initiative within the framework of command intent. It is enabled by decentralization of authority and responsibility that allows subordinate commanders the latitude to plan and conduct operations based upon their understanding of the local situation. Shifting along a continuum of command approaches represents a form of short-term organizational adaptability that has been dubbed 'elasticity' in this paper. It is argued that the roots of this elasticity lie in the concept of command intent, specifically implicit intent. The ability to operate in a decentralized fashion requires that forces create a deep, broad, reservoir of implicit intent. A force that is optimized for centralized operation because of its training, organizational structure, organizational culture, and equipment will not have the same degree of elasticity because it will not have a comparable reserve of implicit intent. All military organizations have a point of equilibrium on the command approach continuum and will experience stress during the period that they move away from this point. These two aspects of a military force -- elasticity and equilibrium -- provide an indication of its capacity for flexibility of command approach. In theory, elasticity increases as the point of equilibrium shifts towards the decentralized end of the continuum. In an age when centralized command is theoretically possible owing to technological advances, forces with the capability for decentralization will retain the advantage. This paper is a defense of mission command. Nevertheless, it is stressed that forces with the capability for decentralized command cannot be created quickly on demand -- no matter how much technology is available. Decentralized command is built on intangible qualities of the force such as trust, expertise, and broad experience, all of which take time to develop and are fragile, thus requiring careful maintenance.

DTIC

*Command and Control; Elastic Properties; Organizations; Risk*

**20080001832** RAND Corp., Santa Monica, CA USA

**Networked Forces in Stability Operations: 101st Airborne Division, 3/2 and 1/25 Stryker Brigades in Northern Iraq**

Gonzales, Daniel; Hollywood, John; Sollinger, Jerry M; McFadden, James; DeJarnette, John; Harting, Sarah; Temple, Donald; Jan 2007; 221 pp.; In English

Contract(s)/Grant(s): DASW01-01-C-0004

Report No.(s): AD-A473243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Stryker brigade, one of the Army's newest units, has advanced command, control, and intelligence capabilities and uses a network-centric concept of operations. These capabilities include the full complement of Army digital communications and battle command systems. Its networked capabilities enabled it to employ network-centric operations (NCO) capabilities down to a lower echelon than other Army units. An important issue for the Department of Defense and the Army is whether these improved capabilities translate into an information advantage and, if so, whether that advantage results in greater mission effectiveness in stability operations. This study attempts to answer those two questions by focusing on the Stryker brigade's performance in stability operations. It employs the case-study methodology to examine three units that operated in the same area in Iraq between 2003 and 2005: the 101st Airborne Division (ABD), the 3/2 Stryker brigade combat team (SBCT), and the 1/25 SBCT. All served in Iraq's northern provinces. The study compares the performance of the units along a number of dimensions. The comparisons between the 101st ABD and the Stryker brigades are especially important because, although the 101st ABD had some advanced battle command systems, it was largely an analog unit, i.e., one that communicated using analog radios and generally used voice-only, line-of-sight communications at the tactical level. We use two of the four U.S. objectives for stability and reconstruction in Iraq to assess the mission effectiveness of stability operations undertaken by each unit. We investigate how the NCO capabilities and other resources available to these units were utilized to conduct stability and counterinsurgency operations and whether these capabilities resulted in improved mission effectiveness.

DTIC

*Iraq; Stability; System Effectiveness*

**20080002276** NASA Glenn Research Center, Cleveland, OH, USA

**A Miniaturized Antenna for Surface-to-Surface and Surface-to-Orbiter Applications**

Nessel, James A.; Zaman, Afroz J.; Miranda, Felix A.; [2005]; 11 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 22-612-30-61-04; No Copyright; Avail.: Other Sources

A folded Hilbert Curve Fractal Antenna (fHCFA) which produces end-fire radiation at S-band and broadside radiation at

Ku-band without switches is presented. Measured gains/bandwidths were 1.2 dBi/10 MHz and 5.4 dBi/500 MHz at 2.3 GHz (S-band) and 16.8 GHz (Ku-Band), respectively. This work offers a candidate compact antenna design for robotic applications in future NASA planetary exploration missions.

Author

*Antenna Design; Spacecraft Antennas; Miniaturization; Miniature Electronic Equipment; Communication Equipment*

**20080002368** Naval Research Advisory Committee, Arlington, VA USA

**Open Systems Architecture for Command, Control and Communications**

Jul 1991; 93 pp.; In English

Report No.(s): AD-A473531; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473531>

The need for precise and timely information in strategic and tactical operations, as well as optimum use of Navy sensors and weapons systems is inhibited by the limits of current Command, Control and Communications (C3) systems architecture and its associated components.

DTIC

*Architecture (Computers); Command and Control*

**20080002424** Naval Postgraduate School, Monterey, CA USA

**Partial Band Jamming Against 802.16a**

Zastrow, Daniel P; Jun 2007; 89 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473625; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473625>

The IEEE 802.16a standard provides for Broadband Wireless Access (BWA) for the global deployment of broadband Wireless Metropolitan Area Networks (WMANs). Commercially known as Wi-Max, the standard aims to provide large amounts of wireless data over long distances, in a cellular type structure with base stations and subscriber stations. The standard uses Orthogonal Frequency Division Multiplexing (OFDM) which allows the transmission of high data rates in severe channel conditions without complex filters. This thesis tested the performance of a developed partial band jamming algorithm on a modified 802.16a standard. The partial band jamming was applied to 1/8, and of the total subcarriers. Additionally, both intentional and unintentional interference were added to the signal. The modified code repeated the signal 48, 96, or 192 times and recombined the data using Maximal Ratio Combining. This thesis explored the potential for performance gains by reducing the data rate with a repetition code.. The evaluation was performed in MATLAB .

DTIC

*Broadband; Frequency Division Multiplexing; Jamming; Radiotelephones*

**20080002561** Naval Postgraduate School, Monterey, CA USA

**Interstate Communications in the Twenty-First Century: Can You Hear Me Now**

Bessone, Anthony; Sep 2007; 93 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473709; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis examines the theoretical insights on the process of interstate bargaining offered by Thomas Schelling and Robert Jervis. Both authors offer competing models for framing the problem of conveying intent in interstate bargaining frameworks. Can states operationalize coercive and compellant bargaining frameworks as described by Thomas Schelling? Or, suggested by Jervis, is the process of interstate communications structurally flawed by perception and misperception? This thesis examines a case study involving Iran s nuclear program and how it is or is not influenced by Israel and the USA, and identifies which theoretical framework, if any, best explains a nation s intent in the international arena.

DTIC

*International Relations; Telecommunication*

**20080002610** Naval Research Lab., Washington, DC USA

**Company and Below Command and Control Information Exchange Study**

Coyne, Joseph T; Stripling, Roy; Pfluger, Kent C; La Budde, Zina; Afergan, Daniel; Oct 22, 2007; 56 pp.; In English

Contract(s)/Grant(s): N00014-06-WX-20812

Report No.(s): AD-A473778; NRL/FR/5511--07-10-154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the results of a recently conducted task analysis on the communications needs for the Marine Corps

Distributed Operations (DO) concept of infantry operations and recommendations based on currently available technologies for outfitting future DO small units. The results of this task analysis should be of use not only to DO but also to other rapidly paced collective/team-oriented operations that would benefit from distributed command and control decision structures. The intent of DO is to take advantage of advanced, distributed information technologies and systems in order to enable these teams to function more autonomously than they have in the past. Communication systems typically employed by the Marine Corps infantry do not offer practical support for this mode of operation. A summary of the advantages and disadvantages of the sensory 'channels' available for communicating timely information is provided. In addition, a description of the desired traits for an effective communications package suitable for modes of team operation such as DO is offered.

DTIC

*Command and Control; Communication Equipment; Decision Making; Military Operations; Organizations*

**20080002619** Massachusetts Inst. of Tech., Cambridge, MA USA

**The Mobile Advanced Command and Control Station (MACCS) Experimental Testbed**

Cummings, Mary L; Oct 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-0622

Report No.(s): AD-A473793; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This DURIP equipment grant is in support of MIT's Humans and Automation Laboratory's (HAL) human supervisory control research in the field of futuristic command and control (C2). This grant allowed for the fabrication of a state-of-the-art, mobile, experimental C2 testbed. It is projected that this piece of equipment will be used for a minimum of ten years in command and control decision support experiments which necessitate travel to various locations on the East Coast of the USA and Canada. The use of this new piece of equipment will allow for experimental costs reduction, greater research convenience, outreach efforts, as well as for more reliable and realistic research settings. It will also give access to subject-matter experts and military personnel who otherwise would not be able to take part in our research.

DTIC

*Command and Control; Decision Support Systems; Test Stands*

**20080002622** Naval Postgraduate School, Monterey, CA USA

**Simulation of Network-Enabled Electronic Warfare Metrics to Assess the Value of Networking in a General Information and Radar Topology**

Chen, You-Quan; Sep 2007; 92 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473797; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis explores information network metrics, the concept of netted radar, and network theory in a network-centric warfare environment. It begins with a discussion of the relationship between the network space and the battlespace. MATLAB simulations are developed to demonstrate the concepts and quantify the network metrics discussed for important information and netted radar configurations. The effect of electronic attack is also addressed. Simulation results to demonstrate the signal-to-noise ratio performance with and without network synchronization are shown, including the degradation due to electronic attack.

DTIC

*Electronic Warfare; Radar; Simulation; Topology*

**20080002625** Library of Congress, Washington, DC USA

**The Army's Future Combat System (FCS): Background and Issues for Congress**

Felckert, Andrew; Oct 11, 2007; 26 pp.; In English

Report No.(s): AD-A473802; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Future Combat System (FCS) is the U.S. Army's multiyear, multibilliondollar program at the heart of the Army's transformation efforts. It is to be the Army's major research, development, and acquisition program consisting of 14 manned and unmanned systems tied together by an extensive communications and information network. FCS is intended to replace such current systems as the M-1 Abrams tank and the M-2 Bradley infantry fighting vehicle. The FCS program has been characterized by the Army and others as a high-risk venture due to the advanced technologies involved and the challenge of networking all of the FCS subsystems together so that FCS-equipped units can function as intended. The FCS program exists in a dynamic national security environment which could significantly influence the program's outcome. The Administration has committed the USA to the Long War, a struggle that could last for decades as the USA and its allies attempt to locate and destroy terrorist networks worldwide. Some question if FCS, envisioned and designed prior to September 11, 2001 to combat

conventional land forces, is relevant in this Long War. The FCS program has achieved a number of programmatic milestones and is transitioning from a purely conceptual program to one where prototypes of many of the 14 FCS systems are under development. With a variety of estimates on the total cost of the FCS program, questions have been raised about FCS affordability, and the Army cites anticipated budgetary constraints for the recent restructuring of the program from 18 to 14 systems. The FCS is experiencing a number of program development issues with some technologies advancing quicker than anticipated, others progressing along predicted lines, while still others have experienced significant delays, often impacting other FCS-related programs.

DTIC

*Aircraft; Combat*

**20080002639** Army Engineer Research and Development Center, Vicksburg, MS USA

**Setup and Operation of the TeleEngineering Communications Equipment - Fixed Site (TCE-F), Version 3**

Williamson, Jeffrey L; Lynch, Larry N; Powell, Jeff; Register, Bryan; Burrow, Richard; Strnger, Jerry; Fryer, Willism C; Nov 2007; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473828; ERDC-SR-07-4; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In fiscal year 1997, the U.S. Army Engineer Research and Development Center initiated a technology demonstration program to determine the feasibility of providing deployed troops with direct access to subject matter experts (SME). Direct access to the SME allows responses to engineering challenges beyond the in-theater capability to be provided without the time delays and costs associated with deploying the SME to the theater. The purpose of this report is to describe the various components of the fixed-site TeleEngineering communications system and to provide the step-by-step procedures required to set up and operate the system. Chapter 2 describes the system components. Chapter 3 provides details on setting up the equipment and the interconnections between the individual components. The operation of the system (i.e., conducting a video teleconference and transferring data) is detailed in Chapter 4, and methods of receiving technical support are discussed in Chapter 5. Appendix A provides a wiring diagram for the fixed-site system; Appendix B summarizes troubleshooting tips.

DTIC

*Communication Equipment; Data Links*

**20080002641** Naval Postgraduate School, Monterey, CA USA

**TwiddleNet: Metadata Tagging and Data Dissemination in Mobile Device Networks**

Clotfelter, Christopher T; Towle, Jonathon E; Sep 2007; 87 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473835; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Current mobile devices are much more than the limited modality communication tools or digital assistants they were only a few years ago; instead they offer a range of content capture capabilities, including high resolution photos, videos and sound recordings. Their communication modalities and processing power have also evolved significantly. Modern mobile devices are very capable platforms, many surpassing their desktop cousins only a few years removed. TwiddleNet is a distributed architecture of personal servers that harnesses the power of these mobile devices, enabling real time information dissemination and file sharing of multiple data types from commercial-off-the-shelf platforms. This thesis focuses on two specific issues of the TwiddleNet design; metadata tagging and data dissemination. Through a combination of automatically generated and user input metadata tag values, TwiddleNet users can locate files across participating devices. Metaphor appropriate custom tags can be added as needed to insure efficient, rich and successful file searches. Intelligent data dissemination algorithms provide context sensitive governance to the file transfer scheme. Smart dissemination reconciles device and operational states with the amount of requested data and content to send, enabling providers to meet their most pressing needs, whether that is continuing to generate content or servicing requests.

DTIC

*Communication Networks; Marking; Metadata*

**20080012142**

**Surface Radiation Budget (SRB) Release 2 Shortwave 3 hourly Data in Native Format (SRB\_REL2\_SW\_3HRLY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2\\_SW\\_3HRLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2_SW_3HRLY)

The SRB data include the average upward and downward fluxes, photosynthetically active radiative flux, aerosol and cloud optical depth, cloud fraction, and solar zenith angle measured at three hourly intervals for each day for the entire globe

between 07/01/1983 and 10/31/1995. These SW surface radiative parameters were derived with the Shortwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=1998-07-26] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=3 hourly; Temporal\_Resolution\_Range=3 hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Aerosols; Optical Thickness; Light (Visible Radiation); Solar Radiation; Short Wave Radiation; Radiance; Clouds (Meteorology); Cloud Cover; Biosphere; Photosynthetically Active Radiation; Vegetation*

### **20080012144**

#### **Surface Radiation Budget (SRB) Release 2 Shortwave Daily Data in Native Format (SRB\_REL2\_SW\_DAILY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2\\_SW\\_DAILY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2_SW_DAILY)

This data set contains upward and downward fluxes, photosynthetically active radiative flux, aerosol and cloud optical depth, cloud fraction, and solar zenith angle measured at three hourly intervals for each day for the entire globe between 07/01/1983 and 10/31/1995. These SW surface radiative parameters were derived with the Shortwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=1998-07-26] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=daily; Temporal\_Resolution\_Range=daily].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Aerosols; Optical Thickness; Light (Visible Radiation); Solar Radiation; Short Wave Radiation; Radiance; Clouds (Meteorology); Cloud Cover; Biosphere; Photosynthetically Active Radiation; Vegetation*

### **20080012292** Voicecraft, Inc., Goleta, CA USA

#### **Vector excitation speech or audio coder for transmission or storage**

Davidson, Grant, Inventor; Gersho, Allen, Inventor; September 19, 1989; 20 pp.; In English

Patent Info.: Filed April 6, 1987; US-PATENT-4,868,867; US-PATENT-APPL-SN-035518; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012292>

A vector excitation coder compresses vectors by using an optimum codebook designed off line, using an initial arbitrary codebook and a set of speech training vectors exploiting codevector sparsity (i.e., by making zero all but a selected number of samples of lowest amplitude in each of N codebook vectors). A fast-search method selects a number N.sub.c of good excitation vectors from the codebook, where N.sub.c is much smaller than the ORIGIN of INVENTION. The invention described herein was made in the performance of work under a NASA contract, and is subject to the provisions of Public Law 96-517 (35 USC 202) under which the inventors were granted a request to retain title.

Official Gazette of the U.S. Patent and Trademark Office

*Audio Frequencies; Coders; Excitation*

**20080012295** California Inst. of Tech., Pasadena, CA USA

**Fiber optic voice/data network**

Bergman, Larry A., Inventor; September 12, 1989; 22 pp.; In English

Patent Info.: Filed March 16, 1988; US-PATENT-4,866,704; US-PATENT-APPL-SN-168663; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012295>

An asynchronous, high-speed, fiber optic local area network originally developed for tactical environments with additional benefits for other environments such as spacecraft, and the like. The network supports ordinary data packet traffic simultaneously with synchronous T1 voice traffic over a common token ring channel; however, the techniques and apparatus of this invention can be applied to any deterministic class of packet data networks, including multitier backbones, that must transport stream data (e.g., video, SAR, sensors) as well as data. A voice interface module parses, buffers, and resynchronizes the voice data to the packet network employing elastic buffers on both the sending and receiving ends. Voice call setup and switching functions are performed external to the network with ordinary PABX equipment. Clock information is passed across network boundaries in a token passing ring by preceding the token with an idle period of non-transmission which allows the token to be used to re-establish a clock synchronized to the data. Provision is made to monitor and compensate the elastic receiving buffers so as to prevent them from overflowing or going empty.

Official Gazette of the U.S. Patent and Trademark Office

*Computer Networks; Fiber Optics; Voice Communication*

**33**

**ELECTRONICS AND ELECTRICAL ENGINEERING**

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

**20080000350** Oregon State Univ., Corvallis, OR USA

**An Efficient and Accurate Method of Estimating Substrate Noise Coupling in Heavily Doped Substrates**

Arunachalam, Sasi K; Aug 24, 2005; 60 pp.; In English

Report No.(s): AD-A471477; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471477>

This thesis presents a Z-parameter based model to predict the substrate noise coupling between two contacts in a heavily doped substrate for frequencies less than 2 GHz. The empirical model is scalable with contact size and spacings between the contacts and model parameters can be readily extracted from simulated or measured data. The error is within acceptable limits and computational costs associated with extraction of substrate parasitics is significantly reduced by using this model compared to numerical techniques. An application of the model to analyze the substrate noise coupling between a digital and analog block also is demonstrated.

DTIC

*Additives; Doped Crystals; Estimates; Estimating; Integrated Circuits; Substrates*

**20080000403** Michigan Univ., Ann Arbor, MI USA

**Ultraviolet Electrically Injected Light Sources With Epitaxial ZnO-Based Heterojunctions**

Bhattacharya, Pallab; Phillips, Jamie; Aug 2007; 15 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0390

Report No.(s): AD-A472232; UM-047983; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472232>

In this effort, significant emphasis was placed on the epitaxial growth and in situ doping of ZnO for optoelectronic devices. The materials research efforts on ZnO have resulted in device-quality material on sapphire substrates for the desired laser diodes, where the eventual material quality improvements necessary for the devices are anticipated for future growth on ZnO substrates. P-type doping of ZnO was demonstrated using nitrogen, though the p-type behavior was found to be unstable over time. In situ arsenic and antimony doping of ZnO was demonstrated, exhibiting either weak p-type behavior or mixed p-type/n-type conduction, though with stable behavior over time. In addition to the binary ZnO, the growth of MgZnO and ZnO/MgZnO heterojunctions was studied. Quantum wells exhibiting efficient radiative recombination were demonstrated, and may form the basis of future ultraviolet LEDs and lasers. Device applications of the ZnO/MgZnO materials were studied,



which included studies of ohmic contacts to ZnO, UV photoconductors, and thin film transistors. The integration of ferroelectric oxide thin films with ZnO was also investigated, as a potential means of locally inverting ZnO to p-type, and to achieve novel multi-functional devices for reconfigurable systems.

DTIC

*Electro-Optics; Epitaxy; Heterojunctions; Light Sources; Quantum Wells; Semiconductor Lasers; Ultraviolet Radiation*

**20080000411** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Nanoscience and Technology at the Air Force Research Laboratory (AFRL)**

Vaia, Richard A; Miracle, Daniel; Cruse, Thomas; May 1, 2005; 45 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472245; AFRL-W-05-0015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472245>

No abstract available

*Composite Materials; Electro-Optics; Military Technology; Nanocomposites; Nanoparticles; Nanotechnology; Research and Development*

**20080000439** Air Force Research Lab., Hanscom AFB, MA USA

**Free Space Measured Loss Comparison of Single and Double Ring Resonators for Negative Index Media**

Derov, John S; Turchinets, Beverly W; Dean, James W; Crisman, Everett E; Drehman, Alvin J; Sep 14, 2007; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2305

Report No.(s): AD-A472294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472294>

Since the first demonstration of negative refractive index using nested or edge coupled split ring resonators and posts, various proposals have been made for improvement of the structures. Loss is an ongoing concern for these media at microwave frequencies and above. One alternate design uses broadside coupled split rings printed front to back on a substrate. This approach, which avoids bianisotropic effects of edge coupled rings, has been demonstrated successfully inside waveguide below cutoff. Our work here investigates the combination of similar broadside coupled rings (BCRs) with negative permittivity posts in a metamaterial prism, rather than the previous guided-wave medium. Free space measurement of negative refraction through a prism has become our standard for proof of negative index. Unlike rectangular wave guide, free space measurement also allows true transverse electromagnetic illumination. To observe the different effects of magnetic and electric coupling in the rings, two different orientations of the ring gap were used. One type has the gap aligned with the post and is symmetric about the electric field axis. The other has the gap turned 90 degrees from the post. The broadside coupled version of each orientation is measured and compared to a single ring version of the same dimensions and orientation for a total of four prisms.

DTIC

*Losses; Measurement; Resonators*

**20080000540** University of Southern California, Los Angeles, CA USA

**Tunable Narrow Linewidth All-Buried Heterostructure Ring Resonator Filters Using Vernier Effects**

Choi, Seung J; Peng, Zhen; Yang, Qi; Choi, Sang J; Dapkus, P D; Jan 2005; 4 pp.; In English

Report No.(s): AD-A471479; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Channel configurable optical filters are realized by using buried heterostructure semiconductor ring resonators. Two rings having slightly different radii are laterally coupled to bus waveguides in a cascaded manner, which affords free spectral range (FSR) expansion and channel configuration by Vernier effects. The effective FSR and spectral linewidth at resonance measured from a drop port are 10.2 and 0.017 nm, respectively, that corresponds to a finesse (F) of 600. By shifting the resonant wavelength of one of the resonators with free carrier injection, the authors demonstrate digital tuning filters where a distinct channel isolation of 15-20 dB is achieved with 0.68-nm spectral spacing.

DTIC

*Fabrication; Optical Filters; Optical Waveguides; Resonators; Semiconductor Devices; Semiconductors (Materials); Tuning*

**20080000548** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Hybrid Micro-Electro-Mechanical Tunable Filter**

Ochoa, Edward M; Sep 2007; 202 pp.; In English

Report No.(s): AD-A472302; AFIT/DS/ENG/07-23; No Copyright; Avail.: Defense Technical Information Center (DTIC)

While advantages such as good thermal stability and processing-chemical compatibilities exist for common monolithic-

integrated micro-electro-mechanically tunable filters (MEM-TF) and MEM-tunable vertical cavity surface emitting lasers (MT-VCSEL), they often require full processing to determine device characteristics. Alternatively, the MEM actuators and the optical parts may be fabricated separately, then subsequently bonded. This ‘hybrid approach’ potentially increases design flexibility. Since hybrid techniques allow integration of heterogeneous material systems, ‘best of breed’ compound optoelectronic devices may be customized to enable materials groups to be optimized for tasks they are best suited. Thus, as a first step toward a hybrid (AlGaAs-polySi) MT-VCSEL, this dissertation reports the design, fabrication, and demonstration of an electrostatically actuated hybrid MEM-TF. A 250x250-um<sup>2</sup>, 4.92-um-thick, AlGaAs-GaAs distributed Bragg reflector was successfully flip-bonded to a polySi piston electrostatic actuator using SU-8 photoresist as bonding adhesive. The device demonstrated 53nm (936.5 - 989.5nm) of resonant wavelength tuning over the actuation voltage range of 0 to 10 V.

DTIC

*Bragg Reflectors; Fabrication; Microelectromechanical Systems; Tunable Filters*

**20080000630** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Stochastic Resonance Investigation of Object Detection in Images**

Repperger, Daniel W; Pinkus, Alan R; Skipper, Julie A; Schrider, Christina D; Dec 2006; 14 pp.; In English

Contract(s)/Grant(s): Proj-2313

Report No.(s): AD-A472478; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Object detection in images was conducted using a nonlinear means of improving signal to noise ratio termed ‘stochastic resonance’ (SR). In a recent USA Patent application, it was shown that arbitrarily large signal to noise ratio gains could be realized when a signal detection problem is cast within the context of a SR filter. Signal-to-noise ratio measures were investigated. For a binary object recognition task (friendly versus hostile), the method was implemented by perturbing the recognition algorithm and subsequently thresholding via a computer simulation.

DTIC

*Detection; Stochastic Processes*

**20080000641** California Inst. of Tech., Pasadena, CA USA

**Proceedings of the 2003 Antenna Applications Symposium. Volume 2**

Schaubert, Daniel; Sep 2003; 208 pp.; In English

Report No.(s): AD-A472514; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Proceedings of the 2003 Antenna Applications Symposium is a collection of state-of-the-art papers relating to antenna arrays, millimeter wave antennas, simulation and measurement of antennas, integrated antennas, and antenna bandwidth and radiation improvements.

DTIC

*Antenna Arrays; Conferences*

**20080000872** NASA Langley Research Center, Hampton, VA, USA

**Electric Field Effects on Fiber Alignment Using an Auxiliary Electrode during Electrospinning**

Carnell, Lisa S.; Wincheski, Russell A.; Siochi, Emilie, J.; Holloway, Nancy M.; Clark, Robert L.; November 29, 2007; 20 pp.; In English; 2007 Materials Research Society (MRS) Fall Meeting, 26-30 Nov. 2007, Boston, MA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews auxiliary and electric field effects on fiber alignment during the process of electrospinning. The contents include: 1) Electrospinning Overview; 2) Experimental Set-up; 3) Jet Exit; 4) Auxiliary Electrode Effects; 5) Electrospinning High Speed Video; 6) Effect of Auxiliary Electrode Position; 7) Micro & Nano Fibers Produced; 8) Micro and Nano Fibrous Mats; 9) Field Effect on Fiber Distribution; 10) Modeling; 11) Calculated trajectories: 5, 10, 15 & 20cm electrode spacing; 12) Off Axis Auxiliary Electrode; 13) Field Strength Effects; and 14) Potential Applications.

CASI

*Alignment; Electric Fields; Electrodes; Electron Spin; Microfibers*

**20080000951** Yonsei Univ., Seoul, Korea, Republic of

**Toxicity and Bio-Safety Evaluation of Magnetic Nanocrystals Designed for Nano-Medical Sensors**

Cheon, Jinwoo; Sep 15, 2006; 23 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0285

Report No.(s): AD-A472526; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472526>

Magnetic nanocrystals exhibit unique superparamagnetic behaviors. When they get into bio-medical systems, these magnetic nanocrystals have the potential to be utilized as probes and vectors for next-generation diagnosis and therapy. However, before one can utilize these nanomaterials in biology, it is important to assess if they have any deleterious properties in biological systems. In this project, toxicity and biosafety of magnetic nanocrystals under both in vitro and in vivo conditions are examined. In specific, cytotoxicity of inverse spinel metal ferrite nanocrystals with four different magnetic compositions 'i.e. Fe<sub>3</sub>O<sub>4</sub>, MnFe<sub>2</sub>O<sub>4</sub>, CoFe<sub>2</sub>O<sub>4</sub>, NiFe<sub>2</sub>O<sub>4</sub>' on macrophage cells is investigated. Nanocrystal 'Fe<sub>3</sub>O<sub>4</sub>' surface charge effect on cellular cytotoxicity are further examined. In addition to such in vitro cellular toxicity of nanocrystals, in vivo biodistribution of Fe<sub>3</sub>O<sub>4</sub> nanocrystals are examined by labeling them with radio-active <sup>111</sup>In-DTPA.

DTIC

*Biological Effects; Biomedical Data; Crystals; Detection; Detectors; Medical Science; Nanocrystals; Safety; Toxicity*

**20080000965** Korea Inst. of Tech., Seoul, Korea, Republic of

**Nanostructured Sublayers for Improved Light Extraction of Top-Emitting and Transparent Organic Electroluminescent Devices**

Chin, Byung D; May 2007; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA5209-06-0184

Report No.(s): AD-A472569; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472569>

The work focused on developing flat-panel transparent display using organic light emitting diode. Microstructure Bragg mirrors were also implemented for higher external luminous efficiency and wider color gamut. In addition, organic phosphorescent light emitting materials and devices were studied.

DTIC

*Electroluminescence; Electro-Optics; Extraction; Light Emitting Diodes; Organic Phosphorus Compounds; Substrates; Transparence*

**20080000988** Air Force Research Lab., Hanscom AFB, MA USA

**SQIF Arrays as RF Sensors (Briefing Charts)**

Yukon, Stanford P; Sep 25, 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A472609; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472609>

As an extension of their extreme sensitivity to small DC magnetic fields, superconducting SQIF (Superconducting Quantum Interference Filter) arrays may be employed as sensitive RF sensors. RF SQIF arrays fabricated with high T<sub>c</sub> Josephson junctions can be cooled with small Sterling microcoolers. This allows their deployment on UAV and satellite platforms. A key issue is whether high sensitivity RF SQIF sensors are able to detect weak signals among a background of high power RF sources and jammers, i.e. to yield a desired SFDR of -100dB. We show that the low frequency power spectrum of Josephson junctions subject to forcing currents greater than their critical current is a limiting factor.

DTIC

*Charts; Detectors; Josephson Junctions; Radio Frequencies*

**20080000990** Library of Congress, Washington, DC USA

**The Foreign Intelligence Surveillance Act: An Overview of the Statutory Framework and Recent Judicial Decisions**

Bazan, Elizabeth B; Sep 22, 2004; 91 pp.; In English

Report No.(s): AD-A472614; CRS-RL30465; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472614>

The Foreign Intelligence Surveillance Act, 50 U.S.C. 1801 et seq., (FISA) as passed in 1978, provided a statutory framework for the use of electronic surveillance in the context of foreign intelligence gathering. Subsequent legislation

expanded federal laws dealing with foreign intelligence gathering to address physical searches, pen registers and trap and trace devices, and access to certain business records. The USA PATRIOT Act of 2001, P.L. 107-56, made significant changes to some of these provisions. Further amendments were included in the Intelligence Authorization Act for Fiscal Year 2002, P.L. 107-108, and the Homeland Security Act of 2002, P.L. 107-296. In addressing international terrorism or espionage, the same factual situation may be the focus of both criminal investigations and foreign intelligence collection efforts. The changes in FISA under these public laws facilitate information sharing between law enforcement and intelligence elements. In its Final Report, the 9/11 Commission noted that the removal of the pre-9/11 'wall' between intelligence and law enforcement 'has opened up new opportunities for cooperative action within the FBI.' On May 17, 2002, the U.S. Foreign Intelligence Surveillance Court (FISC) issued a memorandum opinion and order written by the then Presiding Judge of the court. In the decision, the FISC considered a motion by the U.S. Department of Justice 'to vacate the minimization and 'wall' procedures in all cases now or ever before the Court, including this Court's adoption of the Attorney General's July 1995 intelligence sharing procedures.' The FISC granted the Department's motion, but modified part of the proposed minimization procedures. This report will examine the detailed statutory structure provided by FISA and related provisions of E.O. 12333. In addition, it will discuss the decisions of the U.S. FISC and the U.S. Foreign Intelligence Surveillance Court of Review.

DTIC

*Electronic Equipment; Intelligence; Law (Jurisprudence); Security; Surveillance*

**20080001151** California Univ., Los Angeles, CA USA

**Modeling Multiferroic Materials**

Carman, Greg P; Chang, Gavin; Bush, Grayson; Sep 2007; 14 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0067

Report No.(s): AD-A472800; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The study's focus during the last three years was to analytically understand the effects of material properties as well as configurations on the magnetoelectric coupling in monolithic magnetoelectric materials and magnetostrictive/piezoelectric layered composites (denoted as MELC). The models generated during the last three years provide valuable information on understanding the magnetoelectric coupling behavior and hence maximized the magnetoelectric coupling for magnetoelectric system. The first part of the efforts had been devoted to developing continuum level models for both linear and nonlinear single phase magnetoelectric materials, including the solutions to representative problems. For the second effort, we focus on the MELC modeling. A total of six MELC configurations were studied by this model, including three field orientations, longitudinal, transverse, and in-plane, in both 1-D and 2-D plane geometries. By using the modeling analysis, a 3-D design map covering the span of compliance, Poisson's ratio, and piezomagnetic coefficient ratio of the magnetostrictive phases was generated.

DTIC

*Magnetostriction; Piezoelectricity*

**20080001154** South Carolina Univ., Columbia, SC USA

**Fundamental Studies in Embedded Ultrasonic NDE: Lamb Waves Interaction Between Piezoelectric Wafer Active Sensors and Host Structure**

Chao, Yuh; Jun 2007; 45 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0085

Report No.(s): AD-A472810; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The emerging field of embedded ultrasonic NDE has the potential of producing fundamental changes in structural health monitoring, damage detection, and nondestructive evaluation by using small inexpensive and unobtrusive PWAS transducers that are permanently attached to the structure and can be interrogated at will. Unlike conventional ultrasonic transducers, PWAS are low power non-resonant devices with broadband capabilities. PWAS are about the only transducers that can be embedded in large numbers in the structure without an exorbitant cost and weight penalty. Though the PWAS capabilities have been validated experimentally, the modeling of the PWAS behavior is still being developed. Fundamental aspects of the Lamb-wave interaction between PWAS and host structure during structural health monitoring need to be studied and understood.

DTIC

*Embedding; Lamb Waves; Nondestructive Tests; Piezoelectricity; Transducers; Ultrasonic Radiation; Ultrasonics; Wafers*

**20080001164** Air Force Research Lab., Hanscom AFB, MA USA

**Nascap-2k Self-Consistent Simulations of a VLF Plasma Antenna**

Mandell, M J; Davis, V A; Cooke, D L; Wheelock, A T; Roth, C J; Jun 21, 2007; 17 pp.; In English

Contract(s)/Grant(s): Proj-1010

Report No.(s): AD-A472842; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We simulate the plasma response to a high voltage square wave VLF antenna in Medium Earth Orbit plasma with Nascap-2k. The plasma is modeled with a hybrid Particle-in-cell (PIC) approach with PIC ions and fluid barometric electron densities. The plasma response, collected ion currents, and chassis floating potential are computed self-consistently with a near-square-wave bias applied to the antennas. Particle injection and splitting are used to replenish the plasma depleted at the boundary, represent the thermal distribution, and maintain appropriately sized macroparticles. Therefore, current limitation due to the thermal distribution of ions and the resulting angular momentum barrier are included. Above the ion plasma frequency the plasma current lags the voltage by about 100, while below the ion plasma frequency the current leads the voltage by about 7 degrees.

DTIC

*Antennas; Computerized Simulation; Plasma Antennas; Simulation; Spacecraft Charging; Very Low Frequencies*

**20080001165** National Taiwan Univ., Taipei, Taiwan, Province of China

**Growth and Characterization Studies of InGaN for Optoelectronics, Electronics and Photovoltaic Applications**

Yang, Chih-Chung; Dec 4, 2007; 10 pp.; In English

Contract(s)/Grant(s): FA48690610077

Report No.(s): AD-A472846; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the past few years, we have been performing the research on the growth and characterization of InGaN/GaN nanostructures. Based on those nanostructures, we fabricated efficient dual-color and white-light light-emitting diodes. Meanwhile, we studied the coupling between surface plasmon and InGaN/GaN quantum wells for enhancing the emission efficiency. The detailed research topics are shown as follows 1. Prestrain growth of InGaN/GaN quantum wells for increasing indium incorporation 2. Fs pump-probe study on ultrafast carrier dynamics in InGaN of nanostructures 3. Simulation study on carrier capture by Nano-clusters in InGaN 4. Surface plasmon coupling with InGaN/GaN quantum wells for light emission manipulation 5. Fabrications of blue/green dual-color and white light-emitting diodes 6. Optical and material characterization of ZnO nanostructures 7. Fabrication of anodized-aluminum-oxide 'AAO' ? preparing for patterned InGaN/GaN nano-column growth Also, in cooperating with the scientists at AFRL, we performed the following studies a. Characterization of GaN nano-columns b. GaN over-growth on GaN nano-columns

DTIC

*Characterization; Electro-Optics; Light Emitting Diodes; Nanotechnology; Semiconductors (Materials)*

**20080001173** Chung Shan Inst. of Science and Technology, Taoyuan, Taiwan, Province of China

**The Relationship of Microscopic Material Characteristics & Physical Behavior of Quantum Dots**

Torng, Shan; Fang, Y-C; Hsu, L; Aug 25, 2006; 4 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0302

Report No.(s): AD-A472871; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research collected and analyzed the composition, structure and microstructure information at microscopic scales for the self-organized InAs/GaAs quantum dots through development of proper characterization techniques.

DTIC

*Molecular Beam Epitaxy; Quantum Dots*

**20080001188** Florida Univ., Gainesville, FL USA

**UF Biomotor/Biosensor Nanotechnologies**

Dickinson, Richard B; Purich, Daniel L; McGuire, Gary; Holiday, Brian; Wirtz, Denis; Cooke, William; Zeile, William; Hens, Suzanne; Interliggi, Kimberly; Sturm, Colin; Sep 25, 2007; 53 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0440

Report No.(s): AD-A472921; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report contains a summary of activities on the project 'UF Biomotor/Biosensor Nanotechnologies'. Nanoscale actuators for use as molecular shuttles in biosensing devices were developed based on actin filament end-tracking motors. Novel strategies were developed exploiting these motors and modified substrata to propel and guide motor-coated micro- and

nanoparticles using substratum-bound actin filaments with their elongating plus-ends bound to the particle surface. Key accomplishments of this project include (1) optimization of conditions for particle propulsion in cell extracts, (2) development of single-filament actuators, (3) guidance of single-filament elongation on patterned and microfabricated substrata, (4) development and validation of a mathematical model that predict particle propulsion velocity as a function of controllable parameters, (5) novel time-of-flight mass spectrometry methods to image surfaces, and (6) direct real-time methods to observe protein-protein interactions involved in filament end-tracking in vivo.

DTIC

*Actuators; Biochemistry; Bioinstrumentation; Nanotechnology; Polymerization*

**20080001237** Arizona Univ., Tucson, AZ USA

**Novel Designs and Coupling Schemes for Affordable High Energy Laser Modules**

Moloney, Jerome V; Schulzgen, Axel; Polynkin, Pavel; Mansuripur, Masud; Fallahi, Mahmoud; Fink, Yoel; Chen, Chiping; Sep 28, 2007; 74 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-02-1-0380

Report No.(s): AD-A473011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This multi-disciplinary research effort developed new classes of compact, highly-doped Er/Yb phosphate-doped glass fibers as high power, low noise single wavelength, single mode oscillators. Three world record powers in low-noise, single frequency laser oscillators at the eyesafe wavelength of 1.55 micrometers were reported. The project vertically integrated fabrication, testing, and optimization of all components necessary for manufacturing of fiber laser units including highly doped specialty glasses, fiber preforms, fiber drawing techniques, fiber Bragg gratings, fiber facet coatings, and fusion splicing of fiber components. A novel stack and draw technique produced single and multicore geometries including index guides and micro-structured single and multiple core fibers. Ultra-short pulse generation in these phosphate fibers yielded world record peak intensities and novel applications. The MIT partners developed a novel class of surface emitting fiber lasers based on 1D photonic bandgap confinement. A new class of optically-pumped high-power, high brightness semiconductor vertical-external-cavity surface emitting laser emitting around 980nm were designed using a novel epitaxial quantum design approach and demonstrated experimentally. Power scaling methods such as spectral beam combining and cascaded intra-cavity semiconductor chips were demonstrated as well as visible light generation via intra-cavity second harmonic generation. Over 70 articles were published in peer-reviewed journals.

DTIC

*High Power Lasers; Modules; Semiconductor Lasers*

**20080001250** Naval Undersea Warfare Center, Newport, RI USA

**Quadrifilar Helical Antenna Array for Line-of-Sight Communications Above the Ocean Surface**

Josypenko, Michael J; Casey, John P; Davis, Stephen M; Jun 25, 2007; 76 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473039; NUWC-NPT-TR-11; 820; No Copyright; Avail.: Defense Technical Information Center

(DTIC)

This report describes the development of a linear array consisting of four quadrifilar helical antennas (QHAs) that is mounted on a buoy to support transmit and receive communications at 2.45 GHz along line-of-sight (LOS) paths above a sea water half-space. The array elements are designed to be immune to the multipath interference created by reflections of an incident signal from the surface of the ocean. A novel feed design for the array is described. The circuit and radiation characteristics of each QHA element measured in free space are presented. The predicted radiation pattern of each QHA element at its nominal height above a flat ocean surface is determined from the measured element pattern in free space.

DTIC

*Antenna Arrays; Antenna Radiation Patterns; Helical Antennas; Line of Sight Communication; Linear Arrays; Ocean Surface*

**20080001258** Woods Hole Oceanographic Inst., MA USA

**Acoustic and Oceanographic Observations and Configuration Information for the WHOI Moorings from the SW06 Experiment**

Newhall, Arthur E; Duda, Timothy F; von der Heydt, Keith; Irish, James D; Kemp, John N; Lerner, Steven A; Liberatore, Stephen P; Lin, Ying-Tsong; Lynch, James F; Maffei, Andrew R; May 2007; 118 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0146

Report No.(s): AD-A473050; WHOI-2007-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document describes data, sensors, and other useful information pertaining to the moorings that were deployed from

the R/V Knorr from July 24th to August 4th, 2006 in support of the SWO6 experiment. The SWO6 experiment was a large, multi-disciplinary effort performed 100 miles east of the New Jersey coast. A total of 62 acoustic and oceanographic moorings were deployed and recovered. The moorings were deployed in a 'T' geometry to create an along-shelf path along the 80 meter isobath and an across shelf path starting at 600 meters depth and going shoreward to a depth of 60 meters. A cluster of moorings was placed at the intersection of the two paths to create a dense sensor-populated area to measure a 3-dimensional physical oceanography. Environmental moorings were deployed along both along-shelf and across-shelf paths to measure the physical oceanography along those paths. Moorings with acoustic sources were placed at the outer ends of the 'T' to propagate various signals along these paths. Five single hydrophone receivers were positioned on the across shelf path and a vertical and horizontal hydrophone array was positioned at the intersection of the 'T' to get receptions from all the acoustics assets that were used during SW06.

DTIC

*Acoustic Measurement; Arrays; Mooring; Oceanographic Parameters; Oceanography*

**20080001268** Oregon Univ., Eugene, OR USA

**Slow Light and Adiabatic Bandwidth Variation in Semiconductor Nanostructures**

Wang, Hailin; Feb 23, 2007; 9 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0429

Report No.(s): AD-A473062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have demonstrated a mechanism of tunable optical delay that takes advantage of the strong Coulomb interactions between excitons and free carriers and uses optical injection of free carriers to broaden and bleach an exciton absorption resonance. Fractional delay exceeding 200% has been obtained for an 8 ps optical pulse propagating near the heavy-hole excitonic transition in a GaAs quantum well (QW). We have also developed a scheme of using trions in mixed-type QW to realize a lambda-type three-level system for electron spin coherence in semiconductors.

DTIC

*Adiabatic Conditions; Bandwidth; Nanostructures (Devices); Semiconductors (Materials)*

**20080001421** Xian Univ. of Science and Technology, Xian, China

**Nano-Fabrication: A Review**

Yang, Laixia; Akhatov, Islander; Mahinfalah, Mohammed; Jang, Bor Z.; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 441-446; In English; See also [20080001415](#); Copyright; Avail.: Other Sources

Nano-fabrication techniques that are emerging from laboratories or already on the market are reviewed. These techniques include electron beam or X-ray lithography, soft lithography, micro- or nano-stencil guided deposition, dip-pen or fountain-pen lithography, nano-xerography, scanning nano-lithography, and nano-imprint lithography. The advantages and shortcomings of selected nano-fabrication techniques are highlighted. The possibility of extending highly versatile liquid droplet techniques down to nanometer scales is also critically evaluated. Finally, the authors' perspectives on fruitful future research directions are presented.

Author

*Lithography; Xerography; Nanofabrication; Nanotechnology*

**20080001432** National Tsing Hua Univ., Hsinchu, Taiwan, Province of China

**Failure Life Prediction and Factorial Design of Lead-Free Flip Chip Package**

Chiu, Chien-Chia; Wu, Chung-Jung; Peng, Chih-Tang; Chiang, Kuo-Ning; Ku, Terry; Cheng, Kenny; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 481-490; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC93-2212-E-007-015; Copyright; Avail.: Other Sources

As is well known, the design parameters of the packaging material and structure greatly influence the reliability of the packaging. When it comes to flip chip packages, the package reliability design becomes more complicated. In addition, the interactions between these different design parameters remain unclear, especially for leadfree solder applications. Based on the above, FEM factorial analysis was employed in this study to investigate the interrelationship of the design parameters. A factorial analysis with two levels and five factors was chosen. The factors included pre-solder thickness, thickness of the BT core in the laminate substrate, bumping height, substrate side pad opening, and the climbing height of the underfill. The factorial design method was repeated twice with two kinds of solder bump materials (63Sn/37Pb and 96.5Sn/3.5Ag). The findings show that the structures with the larger BT core thickness, thicker pre-solder layer and higher bump height have the better solder bump reliability. In terms of the factorial analysis, the BT core thickness was the factor having the most influence

on reliability. The interactions between the factors were observed in this study.

Author

*Design Analysis; Factor Analysis; Finite Element Method; Life (Durability); Electronic Packaging; Chips (Electronics)*

**20080001509** Ljubljana Univ., Ljubljana, Slovenia

**Electrotechnical Review, Volume 74, No. 3**

Zajc, Baldomir, Editor; Trost, Andrej, Editor; Bajd, Tadej, Editor; Brglez, Franc, Editor; Divjak, Sasa, Editor; Drnovsek, Janko, Editor; Gubina, Ferdo, Editor; Horvat, Bogomir, Editor; Jezernik, Karel, Editor, et al.; 2007; ISSN 0013-5852; 84 pp.; In Slovene; In English; See also 20080001510 - 20080001521; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Topics include: Analysis of Reasons for Magnetic Asymmetry in Resistance Spot-Welding Systems; Theoretical Background of Oscillation-Based Test of Biquad SC Filter; Error Detection in Industrial Printed Matters Using Image Registration; An Implementation of a Two-Layered SVM Classifier in Condor; Influence of Security Mechanisms on Web Services Interoperability; Common Open Representation of Computer Vision Results in 2DGE Research; Designing a Multimedia Convergence User Interface as a Part of the Concept of the Smart Home for the Target Group of the Elderly; An Overview of ICT Frauds and their Detection with Bi-directional Artificial Neural Networks; Modelling Realistic Autonomous Systems Networks; Impact of Image Degradations on the Face Recognition Accuracy; Multilingual documents in E-speranto; and Extension of the E-model for Objective Assessment of the Jitter Impact on the Perceived Voice Quality in Packet Networks.

Author

*Image Processing; Neural Nets; Pattern Registration; Spot Welds; Asymmetry; Convergence; Detection; Magnetoresistivity*

**20080001510** Ljubljana Univ., Ljubljana, Slovenia

**An Overview of ICT Frauds and their Detection with Bi-directional Artificial Neural Networks**

Krenker, Andrej; Mesojednik, Matevz; Volk, Mojca; Bester, Janez; Kos, Andrej; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 131-137; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

Life and work of individuals and the overall society have become strongly dependent on information communication technology (ICT) systems and services. Due to their complexity, pretentiousness, need of convergence, demand to reduce the time-to-market for new products and services, quality of standards and insufficient testing of end products, ICT systems are vulnerable to frauds. To prevent ICT frauds, it is necessary to identify and know them well. For this purpose we present the most usual and the most frequent ICT frauds and examples and methods used for their detection. Though every ICT fraud is specific, they altogether still have certain common properties, according to which we group them. In literature, ICT frauds are grouped into cloning fraud, toll fraud, subscriber fraud, social engineering fraud, computer intrusion fraud and credit card fraud. They are all discussed in this paper. Methods for detecting ICT frauds have been using artificial neural networks for quite some time. Instead of them we propose to employ sophisticated bi-directional artificial networks that were initially developed for other purposes. We introduce their basic working principle and their incorporation into the system for detecting ICT frauds. In the last section we discuss their adequacy for detecting individual ICT frauds.

Author

*Information Systems; Detection; Neural Nets; Telecommunication; Intrusion*

**20080001511** Ljubljana Univ., Ljubljana, Slovenia

**Impact of Image Degradations on the Face Recognition Accuracy**

Struc, Vitomir; Pavescic, Nikola; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 145-150; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

The accuracy of automatic face recognition systems depends on various factors among which robustness and accuracy of the face localization procedure, choice of an appropriate face-feature extraction procedure, as well as use of a suitable matching algorithm are the most important. Current systems perform relatively well whenever test images to be recognized are captured under conditions similar to those of the training images. However, they are not robust enough if there is a difference between test and training images. Changes in image characteristics such as noise, colour depth, background and compression all cause a drop in performance of even the best systems of today. At this point the main question is which image characteristics are the most important in terms of face recognition performance and how they affect the recognition accuracy. This paper addresses these issues and presents performance evaluation (Table 2.) of three popular subspace methods (PCA, LDA and ICA) using ten degraded versions of the XM2VTS face image database. The presented experimental results show



the effects of different changes in image characteristics on four score level fusion rules, namely, the maximum, minimum, sum and product rule. All of the feature extraction procedures as well as the fusion strategies are rather insensitive to the presence of noise, JPEG compression, colour depth reduction, and so forth, while on the other hand they all exhibit great sensitivity to degradations such as face occlusion and packet loss simulation.

Author

*Degradation; Pattern Recognition; Accuracy; Image Processing; Face (Anatomy)*

**20080001512** Ljubljana Univ., Ljubljana, Slovenia

#### **An Implementation of a Two-Layered SVM Classifier in Condor**

Trebar, Mira; Steele, Igel; *Electrotechnical Review*, Volume 74, No. 3; 2007, pp. 107-112; In English; See also [20080001509](#); Copyright; Avail.: Other Sources

Condor, as a high-throughput distributed computing system, is used in a two-layered Support Vector Machine (SVM) implementation of the classification problem. The complexity of the SVMs training algorithm increases with respect to the number of samples. The data are split into subsets and the solution described reduces the training time by optimizing the first layer SVMs separately on a cluster of computers. As a result, a smaller subset of support vectors from partial results is used to optimize the second layer SVM. For the experiments on a large data set (Forest data), the distributed implementation of two-layered SVMs in Condor shows a significant improvement of the training time by keeping or even improving the error performance of a single SVM classifier.

Author

*Classifiers; Distributed Processing; Algorithms; Machine Learning; Vector Processing (Computers); Computer Programs*

**20080001513** Nuklearni Inst. Jozef Stefan, Ljubljana, Macedonia

#### **Modelling Realistic Autonomous Systems Networks**

Vilhar, Andrej; Novak, Roman; Kandus, Gorazd; *Electrotechnical Review*, Volume 74, No. 3; 2007, pp. 138-144; In English; See also [20080001509](#); Copyright; Avail.: Other Sources

Research and development in global communication architectures and protocols in the Internet often require simulation studies. An authentic simulation model of the network topology is a prerequisite. On the autonomous system level, it is essential to consider different types of business relationships between connected autonomous systems as they reflect directly in connectivity rules implemented in the Border Gateway Protocol (BGP). Consequently, the possibility of routing in the Internet is limited. It has been shown by other authors that disregarding business relationships in simulations leads to substantially shorter routing paths, higher number of alternative paths and lower traffic load on particular nodes and links than in reality. Moreover, we ascertain that some communication scenarios impose availability of business relationships information as a requirement. Modelling business relationships requires a thorough analysis of the real relationships in the Internet. As the information about business contracts is generally considered confidential, recognizing true relationships is a challenging task. We give a survey of methods for their inference. It is also of high importance to study the recognized patterns of relationship links. There are some generally accepted characteristics of the Internet determined by these patterns, e.g. dominance of provider-to-customer and peer-to-peer relationships, certain form of hierarchical interconnection of autonomous systems, etc. Despite the considerable amount of work on business relationship inferences and their analysis, there are not many models which consider the findings. The majority of the proposed topology generators completely ignore them. To the best of our knowledge, there is just one exception. Basically, it is a degree-based topology generator with an extension of power-law distribution paradigm to different types of relationships. We argue that the proposed algorithm fails to adequately resemble important large-scale characteristics of the Internet, e.g. the hierarchical structure and existence of a valid routing path between each pair of autonomous systems. We propose a novel way of modelling, separating the problem of topology generation from the ascribing relationships to links. Focusing on adequate business relationship modelling, the usage of the latest state-of-the-art topology generators becomes possible, thus reducing the difficulty of the problem. We recognize five important characteristics of realistic autonomous system networks and incorporate them in the Type-of-Relationship problem in Random graphs (TRR). Development of a corresponding model is the task of our further research.

Author

*Autonomy; Systems Engineering; Communication Networks; Protocol (Computers); Hierarchies*

**20080001514** Nuklearni Inst. Jozef Stefan, Ljubljana, Macedonia

#### **Theoretical Background of Oscillation-Based Test of Biquad SC Filter**

Kac, Uros; Novak, Franc; *Electrotechnical Review*, Volume 74, No. 3; 2007, pp. 92-98; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

The semiconductor industry follows market demands by developing increasingly complex application-specific integrated

circuits and systems. This introduces new challenges in the process of circuit design and results in numerous difficulties in assuring adequate product quality. The latter is becoming a severe problem as the conventional analog test procedures represent a bottleneck in the development of complex mixed-signal integrated systems. Consequently, research into new techniques supporting a structural approach to the design of testable analog integrated circuits is increasing steadily. Numerous design-for-test techniques for mixed-signal integrated circuits have been proposed in recent years. The oscillation-based test approach has gained considerable popularity and has been applied in testing different classes of mixed-signal circuits. The method is based on the assumption that the tested circuit can be reconfigured into an oscillator. Faulty circuits can then be identified by measuring the oscillation frequency, provided that the output signal is sensitive to component parameters which determine the relevant characteristics of the tested circuit. The main issue in the oscillation-based test is the design of such testability structures and circuit-reconfiguration schemes which provide for efficient test implementation. This paper presents a general approach to the design of test procedures and related structures for the oscillation-based test of analog integrated filters implemented with switched-capacitor structures. A generalized theoretical approach based on the analysis of the generic discrete-time second-order transfer function is presented. Exact relations between the parameters describing the filter circuit in the continuous time domain and the coefficients of the discrete-time transfer function are derived and used to determine necessary conditions for establishing sustained oscillations in the tested circuit. Two different approaches to the transformation of the second-order SC stage into an oscillator are considered. The first technique relies on internal SC stage reconfiguration by using the existing or including additional analog switches. The second approach is based on external nonlinear feedback thus providing for better control of the operation conditions of the circuit under test.

Author

*Oscillations; Silicon Carbides; Electronic Equipment Tests; Structural Design; Integrated Circuits*

**20080001515** Indramat Elektromotorji d.o.o., Slovenia

#### **Analysis of Reasons for Magnetic Asymmetry in Resistance Spot-Welding Systems**

Klopčič, Beno; Dolinar, Drago; Stumberger, Gorazd; *Electrotechnical Review*, Volume 74, No. 3; 2007, pp. 85-91; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

The investigated resistance spot-welding systems are mainly used in automotive industry for welding of car bodies where high quality of welds as well as high reliability of the systems are demanded. This can be achieved only by applying results obtained with numerical analysis of the spotwelding systems in a practical realization. The paper presents results of a numerical analysis of a spot-welding system dynamic behavior. The system is schematically shown in Figure 1. It consists of a semiconductor converter, single phase transformer and full-wave rectifier mounted on the transformer output. The secondary transformer winding consists of two secondary coils and two diodes. The corresponding AC supply voltage on the transformer primary is generated by an H-bridge inverter using the pulse width modulation (PWM) technique. The H-bridge inverter is shown in Figure 3 while the principle of the applied PWM is depicted in Figures 4 and 5. The unwanted current spikes often appear in the transformer primary-coil current during steady-state operation. In order to locate their origin, a numerical analysis of the investigated spot-welding system is performed. The employed spot-welding system dynamic model is given by the equivalent circuit model presented in Figure 6. It is mathematically described by a set of nonlinear equations (1), while the magnetically nonlinear behavior of the transformer iron core is accounted for by (3). The numerical analysis showed that the current spikes are caused by asymmetrical construction of the transformer and an unequal characteristic of the diodes in the output rectifier. Results of the numerical analysis are shown in Figures 7 and 8, while Figure 10 contains the measured results. The undesirable phenomenon of current spikes can be efficiently avoided by correct positioning of carefully chosen diodes in the output rectifier, which was confirmed by the calculated results shown in Figure 9

Author

*Asymmetry; Spot Welds; Resistance; Mathematical Models; Numerical Analysis; Magnetic Measurement*

**20080001516** Maribor Univ., Maribor, Slovenia

#### **Error Detection in Industrial Printed Matters Using Image Registration**

Rakun, Jurij; Zazula Damjan; *Electrotechnical Review*, Volume 74, No. 3; 2007, pp. 99-106; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

In this paper we describe a new approach to detect inferior quality and errors in printing matter using a regular PC and document scanner. Our method relies on a comparison of an inspected document with its referential version. It comprises coarse and fine document image registration first, and then detection of discrepancies between the aligned pixels or regions. Registration deploys binarized images and coarsely aligns them by their centres of gravity-Eq. (2). After overlaying the calculated centres, we match the images by rotating and translating them in a locally limited way. An optimum position is determined using the mean square error (MSE) of matched pixels-Eq. (3). The second registration step refines this position

and is based on affine transformations which, utilizing the MSE criterion again, compute the rotation and translation for an optimum image match-Eqs. (4) to (8). This fine registration works iteratively, with interim interpolations, and introduces a kind of elastic image Prejet 15. junij, 2006 Odobren 24. janzlnr, 2007 correction and results in an optimum fit also when the proportions and sizes of the compared images are not entirely equal. After the images have been optimally registered, discrepancies between individual pixels or regions are looked for. Finally, distribution of detected differences is used in order to mark the most probable ones as caused by inferior printing quality. Errors can be searched either in gray or colour images, optionally also in separate colour planes. A prototype user interface is shown in Fig. 1. We confirmed experimentally that the developed algorithms perform satisfactorily. The error detection rate in documents with a simple structure, mostly images, is about 95%, whereas with complex documents containing a lot of text this figure is about 90% (Figs. 2 nad 3). The results of automated printing errors detection are depicted in Fig. 4 for a simple document and in Fig. 5 for a more complex textual document. The described approach has been successfully validated in an industrial firm. The only drawback found is its rather high computational complexity of  $O(n^2)$ .

Author

*Image Processing; Iteration; Pattern Registration; Printing; Error Detection Codes*

**20080001517** Maribor Univ., Maribor, Slovenia

### **Influence of Security Mechanisms on Web Services Interoperability**

Kocbek, Simon; Juric, Jatzaz B.; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 113-118; In English; See also [20080001509](#); Copyright; Avail.: Other Sources

By integration of information systems using web services, special focus has to be put on security. This article studies security mechanisms for web services. We describe use of cryptography, such as digital signature and encryption in WSS (Web Services Security) specification. We study support for secure web services development on Java platform and .NET framework, analyze interoperability, and implement a secure web service in Microsoft .NET and its client in Java. We identify and analyze the problems related to interoperability.

Author (revised)

*Information Systems; Interoperability; Web Services; Computer Information Security*

**20080001518** Ljubljana Univ., Ljubljana, Slovenia

### **Designing a Multimedia Convergence User Interface as a Part of the Concept of the Smart Home for the Target Group of the Elderly**

Jenko, Moca; Guna, Joze; Kos, Andrej; Pustisek, Matevz; Bester, Janez; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 125-130; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

The elderly and disabled people with their increasing income form a very significant portion of the telecommunication market. By 2020, a quarter of the population in Europe will be over the age of 60, and many of them will face some degree of difficulty in using telecommunication equipment if it is not designed properly to meet their specific requirements. They will need user interfaces (UI) easy to hold or operate with on flat surfaces [13]. The concept of interaction between the elderly and disabled and their technology environment is termed gerontechnology [5]. The new connected environment, i.e. a 'smart home', should give its users the freedom to focus on what they want to do rather than wrestling with technology. A supportive, useful and unobtrusive environment with user friendly accessible devices should be provided [12]. People should carry out their tasks unaware of the complexity of the infrastructure that supports their activities in nearly the same way as people today use household electricity [12]. Used as a communications device or information point nestled in the heart of homes, interactive digital television can improve their quality of life of many elderly and visually impaired people if appropriately accessible [14]. In this paper we present a user-oriented approach to multimedia convergence UI best suiting the elderly and disabled population. We introduce our solution for combining multimedia services, provided via digital interactive television over the Internet Protocol, and digital magnification of texts or pictures. UI as one of the most important features of the telecommunication equipment judged from the user point of view, should be simple, user friendly, easy to learn to operate with, ergonomic, etc.

Author

*Multimedia; Convergence; Communication Equipment; Telecommunication; Protocol (Computers)*

**20080001519** Ljubljana Univ., Ljubljana, Slovenia

### **Multilingual documents in E-speranto**

Omerovic, Sanida; Jakus, Grega; Filimonova, Tatjana; Tomazic, Saso; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 151-157; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

This paper presents the initial design of a formal computer language e-speranto. E-speranto is intended for writing and

storing multilingual e-documents and, in its final stage, to serve as an intermediate language in automatic multilingual translation processes. The language is designed to be computer friendly but still understandable to humans; the latter being important mainly for developers of different applications connected to e-speranto. For this reason the syntax of e-speranto is based on extensible Markup Language (XML) [I]. The basic building block of e-speranto is the sentence. The sentence in e-speranto is a semantic unit which corresponds to the sentence in natural language, but opposed to natural languages, has unambiguous meaning. The meaning and the style of the sentence in e-speranto are distinguished as much as possible. The style is expressed in a form of the so called translation hints. The grammar has no exceptions and it is expressed explicitly via XML attributes. The development of e-speranto consists of the following four phases: 1. development of the syntax, grammar and basic dictionary, 2. development of tools for writing documents in e-speranto, 3. development of interpreters of e-speranto documents in different natural languages, and 4. development of automatic translators from different natural languages to e-speranto. Because of the syntax based on XML, and therefore compatibility with the format of Web pages, e-speranto could be applied in the domain of World Wide Web. After the completion of the 4th phase, a multilingual translation would be possible. Therefore, e-speranto could introduce multilingual Web browsing.

Author

*Linguistics; Languages; Documentation; Semantics; Automatic Control*

**20080001520** Ljubljana Univ., Ljubljana, Slovenia

**Extension of the E-model for Objective Assessment of the Jitter Impact on the Perceived Voice Quality in Packet Networks**

Humar, Iztok; Lamovsek, Primoz; Bogataj, Uros; Meglic, Brane; Bester, Janez; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 158-165; In Slovene; See also [20080001509](#); Copyright; Avail.: Other Sources

Popularization of voice communication in packet networks has induced the need for assessing the perceived voice quality. In the paper, we first focus on the possible disturbances to which the packet networks are exposed. We then introduce methods for assessing the perceived voice quality that have been developed and standardised. Our implementation is based on the E-model frequently used for objective assessments of the perceived voice quality. The model major disadvantage is its inability to correctly assess the jitter impact. In order to avoid this deficiency, we extended the E-model functionality by assessment of the jitter impact. Our extended E-model was implemented in a communication node. The evaluation was made in a synthetic environment by using a comparative approach with a reference measurement equipment for objective voice quality assessment. The results show high agreement of the estimated scores with the scores provided by the reference equipment.

Author

*Communication Networks; Mathematical Models; Internets; Vibration; Protocol (Computers); Packet Switching; Voice Communication*

**20080001521** Navarra Univ., San Sebastian, Spain

**Common Open Representation of Computer Vision Results in 2DGE Research**

Peer, Peter; Segura, Victor; Solina, Franc; Electrotechnical Review, Volume 74, No. 3; 2007, pp. 119-124; In English; See also [20080001509](#); Copyright; Avail.: Other Sources

Data standards are required to enable the development of public data repositories, to improve data sharing and also to enable sound and objective evaluation of different approaches. Here, we introduce a flexible data-format for computer vision results in 2DGE (2D Gel Electrophoresis), which meets data standard expectations. This data-format presents an attempt to standardize the communication between research groups in proteomics and computer vision communities, enabling them to share the data and simply compare automatically obtained image processing results of different computer vision algorithms. The proposed CVRML (Computer Vision Results Markup Language) for 2DGE format is modeled in UML (Unified Modeling Language) and implemented in XML (extensible Markup Language). Software is being developed, which helps us to easily and effectively annotate and visualize the data. We also discuss a possible framework around the annotated database structured in the CVRML manner, which we intend to make publicly available. All the material described in the paper is freely available on the CVRML web portal.

Author

*Computer Vision; Electrophoresis; Document Markup Languages; Image Processing; Algorithms*

**20080001626** National Tsing Hua Univ., Hsinchu, Taiwan, Province of China  
**Specific Approach for Size-Control III-V Quantum/Nano LED Fabrication for Prospective White Light Source**

Hwang, Huey-liang; Aug 10, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0526

Report No.(s): AD-A473080; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473080>

This research achieved a nano-structure LED to enhance the light extraction efficiency in III-V nitride LED. The Triangular lattice PC LED with diameter/periodicity of 300/500nm were patterned separately using the AAO template, E-beam lithography, and then the ICP etching technique. The PC LED could get low and stable forward voltage as compared to the AAO LED and conventional LED. The optical and electrical properties of the nano-structure LED was demonstrated in this project.

DTIC

*Approach Control; Fabrication; Light Emitting Diodes; Light Sources; Nanostructures (Devices)*

**20080001638** National Taiwan Univ., Taipei, Taiwan, Province of China  
**High Efficiency Photovoltaic Devices Fabricated from Self-Assemble Block Insulating-Conducting Copolymer Containing Semiconducting Nanoparticles**

Su, Wei-Fang; Wang, L-Y; Dai, C-A; Chen, C-W; Dec 14, 2005; 25 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0500

Report No.(s): AD-A473098; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473098>

The contractor shall investigate novel self-assembled block insulating-conducting copolymers containing semiconducting nanoparticles for high efficiency photovoltaic devices.

DTIC

*Assembling; Block Copolymers; Fabrication; Insulation; Microelectromechanical Systems; Nanoparticles; Photovoltaic Effect; Semiconductors (Materials); Solar Cells; Thermal Stability*

**20080001643**  
**Control of Interface Structure for the Development of Nanostructured Materials**

Kang, Suk-Joong L; Feb 16, 2007; 6 pp.; In English

Contract(s)/Grant(s): FA5209-04-P-0396

Report No.(s): AD-A473103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473103>

In this investigation, it was shown that the oxygen partial pressure affects considerably the grain boundary structure (morphology) of BaTiO<sub>3</sub>, a model oxide, and further the grain growth behaviour. There was a close correlation between the boundary structure and grain growth behaviour. It was possible, for the first time, to prepare different types of microstructures by properly controlling the oxygen partial pressure. This investigation also showed that with grain growth above a eutectic temperature, dry grain boundaries become wet due to the accumulation of solutes and the thickness of liquid films formed at the boundaries increases. Quantification of boundary structure and the chemical analysis of boundary segregation should be needed in subsequent investigations in order to provide more conclusive data for the new findings.

DTIC

*Barium Titanates; Chemical Analysis; Control Systems Design; Controllers; Grain Boundaries; Microstructure; Nanostructures (Devices)*

**20080001648** Hanyang Univ., Seoul, Korea, Republic of  
**Vertical Alignment of Single-Walled Carbon Nanotubes on Nanostructure Fabricated by Atomic Force Microscope**

Lee, Haiwon; May 1, 2007; 51 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0538

Report No.(s): AD-A473108; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473108>

The mechanisms of SWCNTs behavior in the electrophoresis cells and the vertical alignment of SWCNTs by assistance of ultra sonication were investigated. The electro-deposition by AC voltage was accomplished to compare with the effect of DC voltage. When the combined electric field of DC and AC was applied, the clean and vertically aligned SWCNTs were

deposited on a gold electrode with high density, which may contribute to applying SWCNTs as an electron emission sources in nanoelectronic devices. It was investigated that the catalytic metal nanoparticles are selectively deposited on a chemically-modified Si substrate by dipping method. Based on this method, the vertically aligned SWCNTs were successfully synthesized on a Fe-Mo/MgO/Si substrate using thermal CVD. It was found that the SWCNTs are vertically aligned on substrate by introducing the NH<sub>3</sub> pretreatment process on catalytic metal nanoparticles. The diameter and the density of SWCNTs were controlled by adjusting the flowing rate of NH<sub>3</sub> at the NH<sub>3</sub> pretreatment process. Our experimental results offer possibility in the integration of SWCNTs into nanoelectronic devices.

DTIC

*Alignment; Atoms; Carbon Nanotubes; Direct Current; Electric Fields; Electric Potential; Fabrication; Nanostructure (Characteristics); Nanostructures (Devices); Nanotechnology*

**20080001653** National Chiao Tung Univ., Hsinchu, Taiwan, Province of China

**Surface-Modified Quantum Dots Enhanced Luminescence Polymer Nanocomposites Light Emitting Diode**

Wei, Kung-Hwa; Sep 10, 2006; 25 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0343

Report No.(s): AD-A473117; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473117>

We have prepared highly luminescent dendron-substituted copolyfluorenes that incorporate surface-modified cadmium sulfide nanoparticles. A small percentage of these nanoparticles can be incorporated into the dendritic structures upon tailoring the interfaces between the ligands on the nanoparticles and the dendritic structures in the copolyfluorene. Both the photoluminescence and electroluminescence efficiencies of the polymer nanocomposites are dramatically enhanced--sometimes by more than double--relative to the values of the pure polymer, indicating formation of suitable blue-light polymer nanocomposites light emitting diode.

DTIC

*Cadmium Sulfides; Light Emitting Diodes; Luminescence; Nanocomposites; Nanoparticles; Nanotechnology; Polymers; Quantum Dots*

**20080001663** National Cheng Kung Univ., Tainan, Taiwan, Province of China

**Polymer-Oxide Nanolayer/Al Composite Cathode for Efficient Polymer Light-Emitting Diodes**

Guo, Tzung-Fang; Wen, Ten-Chin; Jun 30, 2007; 38 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0071

Report No.(s): AD-A473133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473133>

This research investigates the function of the polymer-oxide material as the interfacial buffer layer for the fabrication of high performance organic/polymer light-emitting diodes (O/PLEDs). The author proposed to place a salt-free, polymer-oxide nanolayer at the interface between the light-emissive polymer layer with Al as the device cathode instead of using low work function metals, such as Ca or LiF/Al. The processes for preparing the interfacial nanolayer can be easily integrated with the manufacturing procedures for the fabrication of O/PLEDs. The interfacial reaction and the mechanisms of the polymer nanolayer on the enhanced device performance had been well studied. The markedly enhanced device performance is presumed to be the instant formation of a specific carbon-Al complex nanolayer at the cathode interface during the deposition of Al. As a future project, the author has proposed the investigation of the unique organic-oxide nanolayer as the interfacial buffer structure for the fabrication of organic electronic devices.

DTIC

*Cathodes; Electroluminescence; Light Emitting Diodes; Oxides*

**20080001681** Kansas Univ., Lawrence, KS USA

**Characterization of Plasma Etch Processes for Wide Bandgap Semiconductors**

Nordheden, Karen J; Sep 7, 2005; 12 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0220; Proj-3484

Report No.(s): AD-A473162; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473162>

We have completed etch rate determination and plasma diagnostics using optical emission spectroscopy, mass spectrometry, and microwave measurements of average electron densities. The previous diagnostics indicate that the observed

etch rate enhancement might be due in part to an increase in the overall electron density (but not enough to account for the entire etc rate enhancement) and a probable increase in the average electron temperature (energy), both of which lead to increased dissociation of SF6 and the creation of more etch species. We have finally obtained reproducible Langmuir probe results, which show that the electron temperature does indeed increase with the addition of helium to SF6. The design of the Langmuir probe and the measurement technique have been discussed in detail in previous reports. We have found that the key to obtaining reproducible measurements ties with the cleaning procedure used between measurements. This cleaning . procedure removes any impurities that may have collected on the probe tip. This procedure consists of driving the probe tip to carry a high current in inert plasmas (e.g., argon or helium) in order to heat the probe tip to induce refractory cleaning. Plasma chemistries containing SF6 are notorious for contaminating probe tips. The cleaning procedure we have developed which gives reproducible results is given, on the next page.

DTIC

*Energy Gaps (Solid State); Etching; Plasma Diagnostics; Plasmas (Physics); Semiconductors (Materials)*

**20080001700** Korea Inst. of Tech., Seoul, Korea, Republic of

**Synthesis and Modulation of Visible-Bandgap Semiconductor Nanowires and their Optical Sensor Application**

Choi, Kyoung-Jin; Park, Jae-Gwan; Park, Jae-Hwan; Kwon, Seok-Joon; Mar 19, 2007; 11 pp.; In English

Contract(s)/Grant(s): FA5209-06-P-0165

Report No.(s): AD-A473228; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473228>

The work successfully demonstrated syntheses and characterization of CdSxSe1-x (x = 0, 0.25, 0.5, 0.75, 1) nanowires. The high quality crystallinity and optical properties of these nanowires were demonstrated for the potential optical sensor applications. The energy bandgap was also modulated by making solid solutions (CdSxSe1-x) in the spectral region from 1.74 eV to 2.45 eV as a function of the sulfur content. The photo-detector using CdSxSe1-x nanowires demonstrated well defined spectral responses depending on the bandgap energy of CdSxSe1-x nanowires.

DTIC

*Energy Gaps (Solid State); Modulation; Nanowires; Optical Measuring Instruments; Semiconductors (Materials); Solid Solutions*

**20080001836** Air Force Research Lab., Hanscom AFB, MA USA

**Nascap-2k Simulation of a Low-Frequency Antenna in Low-Earth Orbit**

Cooke, D L; Wheelock, A T; Mandell, M J; Davis, V A; Roth, C J; Jan 13, 2005; 14 pp.; In English

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A473251; ARL-VS-HA-TR-2007-1092; No Copyright; Avail.: Defense Technical Information Center (DTIC)

NASCAP-2K can be used to calculate plasmadynamic effects as well as steady-state charging and current collection. In this paper we consider electron dynamics in the sheath of a VLF antenna. We estimate the sheath size, and show 1-D calculations for both sine wave and square wave excitation. The results show strong electrostatic plasma oscillations at the sheath edge. Then we use NASCAP-2K to approach the problem from 2 directions. Run as explicit Particle-in-Cell, NASCAP-2K can duplicate the square wave results through the first maximum in the plasma oscillation, obtaining excellent agreement with the 1-D results. Due to the computational demands of PIC, this approach can only simulate the early transients using a common PC. To learn more about the floating potential of the antenna, NASCAP-2K can be run as hybrid PIC to capture the ion dynamics over the full wave cycle.

DTIC

*Antennas; Computerized Simulation; Low Earth Orbits; Low Frequencies; Plasma Oscillations; Simulation; Spacecraft Charging*

**20080001842** Naval Academy, Annapolis, MD USA

**Multi-pulse Converters and Passive Filtering to Improve Power Harmonics in an Integrated Power System**

Ku, Daniel C; May 7, 2007; 72 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473260; USNA-TSPR-354-(2007); No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA Navy is considering new power distribution architectures for surface combatants to enhance war-fighting capabilities and ship design opportunities. One such concept is the Integrated Power System (IPS) in which a common electric

bus delivers power to both the ship's propulsion system and ship service electric system. One of the main challenges to the IPS/all-electric ship is the introduction of significant harmonic distortion into the main AC distribution bus caused by power electronic equipment. Power electronic equipment is necessary to implement the variable-speed motor drive for propulsion and for power conversion associated with distribution. The harmonic distortion leads to derating distribution equipment and degrading the performance of various system loads. As a result, every system attached to the main distribution bus must be able to accommodate the harmonics or the harmonics must be reduced to acceptable levels. The project's objective is to compare competing strategies that seek to reduce bus harmonics in a naval warship IPS. The subsidiary benefit of this task is to improve the efficiency and minimize the derating factor for shipboard engines, generators, and transformers. The proposed method of reducing harmonics is a system based on multi-pulse rectifiers and passive filtering. A multipulse rectifier is a power electronic device that converts AC power into DC power. Six and twelve-pulse rectifier systems are simulated and evaluated, as well as constructed and tested in the laboratory paradigm for passive filtering is set forth for each system. Size, weight, and acquisition cost estimates are derived from vendor data and assessed for feasibility of implementation on an actual destroyer-class warship. This project demonstrates the feasibility of improving power harmonics in an IPS using a system of multi-pulse converters and filtering.

DTIC

*Harmonics; Systems Integration*

**20080001847** Naval Postgraduate School, Monterey, CA USA

**Sample Size Determination for Estimation of Sensor Detection Probabilities Based on a Test Variable**

Oymak, Okan; Jun 2007; 121 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473270; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this thesis, we study procedures and required sample sizes for estimating the probability of detection as a function of range to target for sensor systems as evaluated by the U.S. Army Yuma Proving Ground. First, we examine the problem within the context of a binomial experiment in order to improve the current estimation method used by the U.S. Army Yuma Proving Ground. Specifically, we evaluate the coverage probabilities and lengths of widely used confidence intervals for a binomial proportion and report the required sample sizes for some specified goals. Although the required sample sizes turn out to be impracticably large, we provide the U.S. Army Yuma Proving Ground with a better understanding of the usual confidence intervals and variability inherent in their current estimation scheme. Second, we show that confidence intervals for a probability of detection as a function of range based on the fit of a simple linear logistic regression model perform much better than the usual confidence intervals for a binomial proportion. Using an empirical approach based on a controlled set of simulations, we then determine the required sample size within the experimental region of interest.

DTIC

*Binomials; Confidence Limits; Detection; Probability Theory; Size Determination*

**20080001854** Purdue Univ., West Lafayette, IN USA

**Development of Process Technologies for High-Performance MOS-Based SiC Power Switching Devices**

Cooper, James A; Capano, Michael A; Feldman, Leonard C; Skowronski, Marek; Williams, John R; Aug 1, 2007; 441 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-05-1-0437

Report No.(s): AD-A473280; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this work we developed the technology for 20 kV insulated gate bipolar transistors (IGBTs) in 4H-SiC. The p-channel IGBT is formed on a 175-micron p-type epilayer on an n+ substrate. The n-IGBT is formed on the C-face of a 200-micron n-type free-standing epilayer. When operated at 300 W/cm<sup>2</sup>, the p- and n-IGBTs carry 30 and 27 A/cm<sup>2</sup> respectively, independent of temperature from 23 deg C to 175 deg C. These results were made possible by advances in epigrowth of thick SiC epilayers with low doping, high carrier lifetime, and minimal basal plane dislocations. Ambipolar lifetimes as high as 1.7 microns and BPD densities as low as 2.6 cm<sup>-2</sup> were achieved. The work was further supported by research on the MOS interface on both C-face and Si-face SiC, including studies of threshold voltage and long-term reliability. Oxides on the C-face have comparable mobility to those on the Si-face, but lower breakdown fields and reduced long-term reliability.

DTIC

*Bipolar Transistors; Metal Oxide Semiconductors; Silicon Carbides; Switching; Switching Circuits*



**20080001876** Air Force Research Lab., Hanscom AFB, MA USA

**Nascap-2k Simulations of a VLF Plasma Antenna**

Mandell, Myron J; Davis, Victoria A; Cooke, D L; Wheelock, A T; Roth, Christopher J; Apr 2005; 15 pp.; In English

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A473320; AFRL-VS-HA-TR-2007-1093; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The response of a plasma to very low frequency (VLF) (3 kHz to 20 kHz) antennas at orbital altitudes of 1000 to 10,000 kilometers has been a subject of scientific interest for many decades. As this antenna frequency is less than either the plasma frequency or the electron gyrofrequency, (both nearly 300kHz for a plasma density of  $10^{19}$  cu cm and a magnetic field of 0.1 gauss), only certain modes can propagate as an electromagnetic (EM) wave, and the near field is dominated by electrostatic (ES) effects. Although a comprehensive self-consistent EM-ES simulation would be the desired goal, there are many computational challenges to be overcome, so we begin with a quasi-static simulation so as to sort out the dominant ES effects. We present antenna simulations using Nascap-2k modeling the plasma using both an explicit Particle-in-cell (PIC) approach and a hybrid approach with PIC ions and fluid barometric electron densities. In the latter, electron plasma oscillations are suppressed, while in the former they are excited. Accuracy of the simulations is assessed by comparison with lower-dimensional simulations of similar cases.

DTIC

*Antennas; Computerized Simulation; Plasma Antennas; Responses; Simulation; Spacecraft Charging; Very Low Frequencies*

**20080001881** Naval Academy, Annapolis, MD USA

**Dielectric Studies in Materials for High Energy Density Capacitors**

Turo, Andrew J; May 4, 2007; 53 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473325; USNA-TSPR-361; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The energy requirements of technologies today are more demanding than ever. The requirement for large energy storage and a quick release of that energy is becoming a greater and greater problem. Limited by size, cost, and the speed of chemical reactions, batteries need to be replaced as a primary source of stored energy. Capacitors have the ability to perform in many of the areas where batteries and other energy sources fall short. One way to increase the performance of a capacitor is by inserting a dielectric material. The dielectrics polypropylene and Ultem were the focus of this study, polypropylene as a control and Ultem due to its ability to handle high temperatures, structural stability, and good dielectric characteristics. Ultem was studied in both its pure form and with the addition of mesoporous silica, which theoretically should lead to an increase in dielectric performance while maintaining structural stability. This was done through the casting of Ultem films which underwent dielectric breakdown testing and broadband dielectric spectroscopy. Broadband dielectric spectroscopy analyzed the AC voltage and current relationship in materials at different frequencies and temperatures. The data produced allowed the calculation of the dielectric constant and loss and gives insight into these values. Dielectric strength measurement is a new experiment at the Naval Academy, so part of this project was to develop the methods to be used. This involved developing sample preparation techniques, voltage ramping procedures, and validations of the test equipment. Results confirm the This, however, was extremely dependant on the thickness of the material tested. Mesoporous silica was added to the Ultem in an effort to improve breakdown strength. However, when mesoporous silica was added to cast samples, the samples become brittle and had a drop in the breakdown strength.

DTIC

*Capacitors; Dielectric Properties; Dielectrics*

**20080001887** Naval Surface Warfare Center, Bethesda, MD USA

**Analysis of Time-History data of Forces and Motions Measured at Towing Facilities**

Hong, Young S; Fullerton, Anne; Sep 2007; 41 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 1405WX20612

Report No.(s): AD-A473333; NSWCCD-50-TR-2007/008; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Methods to filter and to analyze measured data are described and the numerical results are validated with the generated data. A lowpass filter is used to eliminate the noise of the measured data. The methods of zero crossing, sine function and spectral analysis are applied to compute the amplitudes, periods and phase angles. The numerical results of the measured data are compared with those of different methods. When the measured data are sinusoidal, the results analyzed with the three

methods agree very well. The computer program, HARMON is written to analyze many files of the measured data.  
DTIC

*Computer Programs; Harmonic Analysis; Low Pass Filters; Spectrum Analysis*

**20080001890** Massachusetts Inst. of Tech., Lexington, MA USA

**Evaluation of a Wideband Direction Estimation Algorithm for Acoustic Arrays**

Peli, Tamar; Feb 11, 1988; 49 pp.; In English

Contract(s)/Grant(s): F19628-85-C-0002

Report No.(s): AD-A473337; CMT-105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Simulated data has been used to evaluate the performance of an acoustic target detection and direction estimation algorithm. The signals used to test the algorithm were simulated acoustic signals propagating across a nine-sensor, tri-delta array. Band-limited broadband sources as well as periodic sources were simulated. The outputs of the algorithm consisted of azimuth and power estimates along with a quantity intended as a quality measure for the azimuth estimates.

DTIC

*Acoustic Measurement; Algorithms; Arrays; Broadband*

**20080001899** Wisconsin Univ., Madison, WI USA

**Microwave Properties of Atomic Layer Controlled HTS Thin Films**

Eom, Chang-Beom; Nov 2006; 5 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0323

Report No.(s): AD-A473346; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have studied the nonlinear microwave response of epitaxial HTS thin films in collaboration with Dr. Dan Qates at MIT Lincoln Lab. In order to make highest quality control. The nonlinearity of single layer YBCO degrades as the films are grown thicker due to the degradation of the crystalline quality and flux pinning of YBCO films. However YBCO/ICeO<sub>2</sub> multilayer stacks shows significant improvement of high-power capabilities.

DTIC

*Atoms; Distortion; High Temperature Superconductors; Microwaves; Thin Films*

**20080001937** Naval Postgraduate School, Monterey, CA USA

**Robust Model-Based Fault Diagnosis for DC Zonal Electrical Distribution System**

Stevens, John D; Jun 2007; 200 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473418; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A key element of the U.S. Navy's transition to an electric naval force is an Integrated Power System (IPS) that provides continuity of service to vital systems despite combat damage. In order to meet subsequent survivability standards under a reduced manning constraint, the IPS system must include a fault tolerant control scheme, capable of achieving automated graceful degradation despite major disruptions involving cascading failures. Toward this objective, online modelbased residual generation techniques are proposed, which identify explicitly defined faults within a stochastic DC Zonal Electrical Distribution System (DC ZEDS). Two novel polynomial approaches to the design of unknown input observers (UIO) are developed to estimate the partial state and, under certain conditions, the unknown input. These methods are shown to apply to a larger class of systems compared to standard projection based approaches where the UIO rank condition is not satisfied. It is shown that the partial-state estimate is sufficient to the computation of residuals for fault diagnosis, even in such cases where full-state estimation is not possible. In order to reduce the complexity of the system, a modular approach to Fault Detection and Isolation (FDI) is presented. Here, the innovations generated from a bank of Kalman filters (some of them UIOs) act as a structured residual set for the stochastic DC ZEDS subsystem modules and are shown to detect and isolate various classes of faults. Certain mathematical models are also shown to effectively identify input/output consistency of systems in explicitly defined fault conditions. Numerical simulation results are based on the well-documented Office of Naval Research Control Challenge benchmark system, which represents a prototypical U.S. Navy shipboard IPS power distribution system.

DTIC

*Damage; Error Analysis; Fault Detection*

**20080001943** Houston Univ., TX USA

**Materials, Processing and Quality Control for High Performance Coated High Temperature Superconducting Conductors**

Chu, C W; Nov 2006; 15 pp.; In English

Contract(s)/Grant(s): FA9550-01-1-0391; F49620-01-1-0391

Report No.(s): AD-A473427; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We explored ways both to enhance  $J_{sub c}$  and to optimize/simplify the manufacturing procedures for coated YBa<sub>2</sub>Cu<sub>3</sub>O<sub>x</sub> (YBCO) conductors. For  $J_{sub c}$ -enhancement, we found that the nano-size interface-irregularity through inserting a (Nd<sub>1/3</sub>Eu<sub>1/3</sub>Gd<sub>1/3</sub>) Ba<sub>2</sub>Cu<sub>3</sub>O<sub>x</sub> sublayer is an effective way to enhance the critical current density ( $J_{sub c}$ ). Enhancements up to 50% have been observed, especially under high magnetic fields. We also found that the Ca-substituted overlayer on YBCO films with poor crystalline structure can significantly improve the grain misalignment and  $J_{sub c}$ . Partial substitution of Y by rare earth elements as previously suggested, however, does not lead to better performance in our synthesis conditions. For manufacturing, copper-metal with electroplated Ni-layer and CeO<sub>2</sub>-buffer layer has been tested as a cheaper and more convenient alternative for the traditional textured Ni. High crystalline texture has been achieved. The in-plane misalignment angle,  $\Delta\phi \sim 5-10$  deg, is comparable to those on traditional rolling-assisted MOCVD has also been tested in synthesizing both the buffer layer and YBCO films. Reasonable  $J_{sub c}$  (77 K) up to  $10 \times 10^6$  A/sq cm has been achieved with a very fast process rate.

DTIC

*Coatings; Conductors; Current Density; High Temperature; Quality Control; Superconductivity; Superconductors (Materials); YBCO Superconductors*

**20080002117** Air Force Research Lab., Brooks AFB, TX USA

**Numerical Modeling of Antenna Near Field**

Singh, Surendra; Roach, William P; Aug 2007; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7757

Report No.(s): AD-A473446; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work provides numerical modeling for the near field of a wire antenna. The conventional near field definition is provided along with an explanation for the maximum power density in the near field. Numerical results are provided for the electric and magnetic fields in the near field region. The results obtained from the model are shown to compare very well with data available in the literature for the thin wire case. The variation of the wave impedance and power density are also studied. A listing of the code developed in MATLAB is included in an appendix.

DTIC

*Antenna Radiation Patterns; Antennas; Mathematical Models; Near Fields*

**20080002143** Defence Science and Technology Organisation, Edinburgh, Australia

**Power-Aperture Product, Efficiency, Signal to Noise Ratio and Search Function Time of Weighted Phased Arrays**

Alexopoulos, Aris; Shaw, Andrew; Jul 2007; 20 pp.; In English

Report No.(s): AD-A473123; DSTO-TR-2013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473123>

The power-aperture product and efficiency of weighted phased arrays is examined for various windows. The impact on the signal to noise ratio is also investigated for the use of windows on the transmit and receive modes of operation of the array and we examine the dependence of the search function time on the array windows. In determining the search function time to conduct surveillance over a given region of space it is necessary to obtain the surveillance solid angle which we obtain via an integral solution.

DTIC

*Apertures; Phased Arrays; Power Efficiency; Signal to Noise Ratios*

**20080002145** Texas-Pan American Univ., Edinburg, TX, USA

**Electromagnetic Shielding Effectiveness Analysis of Nanoreinforced Polymer Composites**

Lozano, Karen; Fuentes, Arturo; Aug 22, 2007; 4 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0474

Report No.(s): AD-A473116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473116>

The team conducted dielectric analysis of samples to promote a better understanding of the mechanisms involved in

changes in dielectric structure of microstructures exposed to varying frequency fields and temperatures. The results were published as S. Yang, R. Benitez, A. Fuentes, and K. Lozano, 'Dielectric Analysis of VGCNF Reinforced Polyethylene Composites,' *Composite Science and Technology*, Vol. 67, No. 6, p. 1159 (2007). A journal article also was published relating to the physical integrity of the polymer composite due to microwave radiation: R. Benitez, A. Fuentes, K. Lozano, 'Effects of Microwave Assisted Heating of Carbon Nanofiber Reinforced High Density Polyethylene,' *Journal of Materials Processing Technology*, Vol. 190, p324-331 (2007).

DTIC

*Carbon Fibers; Composite Materials; Dielectrics; Electromagnetic Shielding; Fiber Composites; Polyethylenes; Shielding*

**20080002158** Defence Science and Technology Organisation, Victoria, Australia

#### **Enhancement of Drain-Down Capabilities of Submarine Antennae**

Dimas, Jim; Scardino, Andrew J; Lewis, John A; Jul 2007; 16 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473247; DSTO-TR-2012; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Water droplets on submarine antennae degrade signal transmission and increase signature. To improve antennae coating performance a surface which repels water is required. In this study several experimental coatings were compared for their ability to remove water droplets from their surface. The contact angle of a drop of water on each surface was recorded as well as the hysteresis, which is a measure of how easily a droplet will roll off an inclined surface. It was found that the experimental coatings from the University of NSW had the highest contact angles and lowest hysteresis over a 1 week period of immersion in seawater. These coatings may provide far better drain-down capabilities than the standard polyurethane coatings presently used. Other coatings such as Intersleek and Rain-X provided short-term improvements in drain-down efficiency, with the added advantage of easy application.

DTIC

*Antennas; Augmentation; Coatings; Drainage; Hydrophobicity; Submarines; Surface Treatment; Water*

**20080002213** NASA Glenn Research Center, Cleveland, OH, USA

#### **SRG110 Stirling Generator Dynamic Simulator Vibration Test Results and Analysis Correlation**

Lewandowski, Edward J.; Suarez, Vicente J.; Goodnight, Thomas W.; Callahan, John; December 2007; 14 pp.; In English; Fourth International Energy Conversion Engineering Conference and Exhibit (IECEC), 26-29 Jun. 2006, San Diego, CA, USA; Original contains color illustrations  
Contract(s)/Grant(s): WBS 22-972-20-01

Report No.(s): NASA/TM-2007-214698; AIAA Paper-2006-4063; E-15899; Copyright; Avail.: CASI: [A03](#), Hardcopy

The U.S. Department of Energy (DOE), Lockheed Martin (LM), and NASA Glenn Research Center (GRC) have been developing the Stirling Radioisotope Generator (SRG110) for use as a power system for space science missions. The launch environment enveloping potential missions results in a random input spectrum that is significantly higher than historical radioisotope power system (RPS) launch levels and is a challenge for designers. Analysis presented in prior work predicted that tailoring the compliance at the generator-spacecraft interface reduced the dynamic response of the system thereby allowing higher launch load input levels and expanding the range of potential generator missions. To confirm analytical predictions, a dynamic simulator representing the generator structure, Stirling convertors and heat sources were designed and built for testing with and without a compliant interface. Finite element analysis was performed to guide the generator simulator and compliant interface design so that test modes and frequencies were representative of the SRG110 generator. This paper presents the dynamic simulator design, the test setup and methodology, test article modes and frequencies and dynamic responses, and post-test analysis results. With the compliant interface, component responses to an input environment exceeding the SRG110 qualification level spectrum were all within design allowables. Post-test analysis included finite element model tuning to match test frequencies and random response analysis using the test input spectrum. Analytical results were in good overall agreement with the test results and confirmed previous predictions that the SRG110 power system may be considered for a broad range of potential missions, including those with demanding launch environments.

Author

*Vibration Tests; Correlation; Dynamic Structural Analysis; Simulators; Stirling Cycle; Electric Generators; Mathematical Models; Radioisotope Heat Sources*

**20080002245** Army Research Development and Engineering Command, Warren, MI USA

**Non Destructive Testing of Body Armor Plates for Structural Integrity**

Meitzler, Thomas; Mar 2007; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473219>

These briefing charts present a method for testing the structural integrity of the strike plate portion of body armor plate. An AC voltage will cause the piezoelectric transducer to vibrate and this vibration when coupled to the material being tested will excite a resonant mode in the plate which can then be measured by another transducer. A new plate will have the reference mechanical modes of vibration. Used plate will have a different set of vibration modes due to a different structure. This test configuration will show a profound change of the amplitude of the transmission signal if the plate is cracked or has holes in it.

DTIC

*Armor; Damage Assessment; Destructive Tests; Nondestructive Tests; Piezoelectric Transducers; Structural Failure; Vibration*

**20080002278** NASA Glenn Research Center, Cleveland, OH, USA

**Diffraction of Harmonic Flexural Waves in a Cracked Elastic Plate Carrying Electrical Current**

Ambur, Damodar R.; Hasanyan, Davresh; Librescu, iviu; Qin, Zhanming; Proceedings of the Royal Society A; November 08, 2005; Volume 461, No. 2063, pp. 343-3560; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1098/rspa.2005.1512>

The scattering effect of harmonic flexural waves at a through crack in an elastic plate carrying electrical current is investigated. In this context, the Kirchhoffian bending plate theory is extended as to include magnetoelastic interactions. An incident wave giving rise to bending moments symmetric about the longitudinal z-axis of the crack is applied. Fourier transform technique reduces the problem to dual integral equations, which are then cast to a system of two singular integral equations. Efficient numerical computation is implemented to get the bending moment intensity factor for arbitrary frequency of the incident wave and of arbitrary electrical current intensity. The asymptotic behaviour of the bending moment intensity factor is analysed and parametric studies are conducted.

Author

*Bending Theory; Cracks; Elastic Plates; Magnetostriction; Wave Diffraction; Wave Scattering*

**20080002344** Air Force Research Lab., Edwards AFB, CA USA

**Effects of Helicon Wave Propagation Based on a Conical Antenna Design: Part I (Preprint)**

Reilly, Michael P; Miley, George H; Kirtley, David E; Koo, Justin; Hargus, Jr, William A; Aug 21, 2007; 32 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473488; AFRL-PR-ED-TP-2007-388; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473488>

An annular field reversed configuration (FRC) plasma concept is being developed by the University of Michigan and AFRL to investigate inductively-coupled high power electric propulsion. Presented is the continued exploration of an annular FRC with specific focus on main bank discharges, magnetized plasma toroid formation, and preliminary investigation into plasma translation. Additional detail is given towards discharge parameter space, optimization of energy input/translation, and predictive scaling laws of magnetic flux, plasma density, and plasma energy content. The discharge parameter space covers multiple charging energies, voltages, and timing as well as multiple propellants and pre-ionization techniques. Finally, a case for FRC formation is made by investigating magnetic field (and flux) reversal in the coil as well as downstream magnetic field modification by a high density magnetized plasma.

DTIC

*Antenna Design; Conical Bodies; Plasma Waves; Wave Propagation*

**20080002358** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Polymer Nanocomposite Thin Film Mirror for the Infrared Region (Preprint)**

Mandzy, N; Grulke, E; May 2007; 17 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-5053; Proj-4347

Report No.(s): AD-A473514; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473514>

Thin film metal oxide coatings have been used commercially for electromagnetic filters from the UV to the infra red regions for over half a century. Deposition onto a substrate has typically been accomplished using vapor deposition techniques and more recently sol-gel methods. These coatings provide very good optical performance under abrasion, thermal cycles and variable humidity when applied on substrates with similar thermal and mechanical properties. When conventional metal oxide coatings are applied to flexible, relatively soft substrates such as polymers, mismatches in mechanical properties can reduce interfacial adhesion or accelerate mechanical failures. The authors recently developed anti-reflective optical filters utilizing self-assembled thin film polymer nanocomposites on polymer substrates using less than five discrete layers. This paper describes the first time demonstration of an IR mirror using fifteen discrete layers with an IR-reflectance that exceeds 90 percent at 1064 nm and transparent in the visible spectrum.

DTIC

*Antireflection Coatings; Infrared Instruments; Infrared Radiation; Metal Coatings; Mirrors; Nanocomposites; Thin Films*

**20080002410** Michigan State Univ., East Lansing, MI USA

**Improved Control Authority in Flexible Structures Using Stiffness Variation**

Mukherjee, Ranjan; Shaw, Steven W; Jun 2007; 11 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0069

Report No.(s): AD-A473600; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473600>

This research investigated control authority enhancement in structural systems through methodical stiffness variation. Our early work focused on stiffness variation in a cantilever beam under the application of a buckling-type end force and control designs based on switching of the end force. Towards the end of the project, our modeling, control, and experimental methods were extended to truss-like structures. An important extension of the work was tuning of beam-type MEMS resonators through stiffness variation generated by follower and axial end forces. In addition to structural control using end forces, switching strategies were developed for piezoelectric transducers to enhance controllability and observability of flexible structures. By switching the transducers between actuator and sensor modes, we demonstrated the possibility of reducing control system hardware. A significant portion of our effort focused on modal energy redistribution through stiffness variation with the objective of simplifying control design. The energy flow between modes in different stiffness states was quantified and validated through preliminary experiments.

DTIC

*Piezoelectric Transducers; Stiffness*

**20080002440** Space and Naval Warfare Systems Center, San Diego, CA USA

**Fano Bounds for Compact Antennas. Phase I**

Allen, J C; Meloling, J; Oct 2007; 77 pp.; In English

Report No.(s): AD-A473663; SSC/SD-TR-1962; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473663>

Impedance matching is a canonical problem in electrical engineering -- design a matching network that transfers maximum power from a generator to a load. Although the loads in this report are restricted to compact antennas, the mathematical exposition applies to any lumped load. Finding a good matching network is a difficult numerical optimization problem. Therefore, techniques that compute bounds on the matching provide valuable information. For example, the Fano bounds discussed in this report bound the matching performance as a function of the frequency band. Therefore, the circuit design can see the matching performance against the bandwidth to make design decisions without having to solve countless matching problems. Moreover, the Fano bounds provide an excellent benchmark to assess the performance of actual matching circuits getting close enough to the best bounds is good enough. The Fano bounds are computed by maximizing the matching performance under inequality constraints. The inequality constraints are determined by analytic expansions of the load. Because symbolic manipulators compute these expansions and the numerical packages can solve the inequality constraints, the Fano bounds may be amenable to a hands-free computation. However, the sticking point for the Fano bounds is the

requirement that the load be given in the Darlington representation. Therefore, this Phase I effort shows that the Fano bounds can automate and defers the Darlington computation to Phase II.

DTIC

*Frequencies; Impedance Matching*

**20080002552** Army Research Lab., Adelphi, MD USA

**Design of the Transmission Electron Microscope (TEM) Sampler Scriber Template as Developed to Improve and Simplify the Sample Preparation Procedure**

Sarney, Wendy L; Oct 2007; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473696; ARL-TR-4299; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The image quality and visibility of the crystal planes in a TEM sample directly relate to how we initially cleave the wafer during the sample preparation process. For diffraction-contrast imaging, many defects and other crystalline features are orientation specific, and are only visible along certain zone axes. The resolution limits of the TEM dictate the preferred zone axes for phase-contrast imaging. The TEM Sample Scribing Template described here allows easy selection of the zone axes by cleaving the wafer along specific crystal directions.

DTIC

*Electron Microscopes; Samplers; Templates*

**20080002578** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Peptide-Assembled Optically Responsive Nanoparticle Complexes (Preprint)**

Naik, Rajesh R; Slocik, Joseph M; Tam, Felicia; Halas, Naomi J; Mar 2007; 17 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0021; EEC-0304097; Proj-4348

Report No.(s): AD-A473736; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The design of active nanostructures whose form and properties can be modulated by remote means is an important challenge in nanoscience. Here we report two types of active nanoparticle complexes, with properties controlled by near infrared illumination, resulting from the assembly of photothermally responsive plasmonic nanoparticles with thermally labile bimolecular linkers. Au nanoshells (NS) and quantum dots (QD) are assembled using coiled-coil peptides into NS-NS and NS-QD complexes. Illumination of the NS-NS complexes results in reversible disassembly-reassembly, while illumination of NS-QD complexes results in a large, reproducible modulation of the quantum dot fluorescence without disassembly of the nanoparticle-peptide complex.

DTIC

*Nanoparticles; Nanostructures (Devices); Peptides*

**20080002597** Maryland Univ., College Park, MD USA

**Spike Neuromorphic VLSI-Based Bat Echolocation for Micro-Aerial Vehicle Guidance**

Horiuchi, Timothy K; Krishnaprasad, P S; Mar 31, 2007; 16 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0130

Report No.(s): AD-A473759; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We summarize the state of the various projects our laboratories have pursued during the course of this support. This includes multiple efforts related to a VLSI-based echolocation system being developed in one of our laboratories from algorithm development, bat flight data analysis, to VLSI circuit design and testing of these algorithms. We have pursued investigations into the spike-based implementation of the interaural-intensity processing regions of the bat brainstem and midbrain with our VLSI modeling of the lateral superior olive (LSO), the dorsal nucleus of the lateral lemniscus (DNLL), and the inferior colliculus (IC). We summarize an exciting new perspective that neurobiologically-realistic, conductance-based synaptic integration is better suited for the particular computations we are seeking. In collaborative work with Cynthia Moss, we have been analyzing previously-captured bat flight data to understand the strategy the bat appears to use in the capture of moving targets. The analysis and computations underlying this problem is closely aligned to the techniques used in describing a control law for explaining a hunting behavior ('motion camouflage') observed in the visually-guided dragonfly. We continue to develop new circuits for an ultrasonic cochlea and have uncovered interesting new issues in our choice for representing the intensity of signals. We have just finished testing the first chip version of an echo-timing-based algorithm ('openspace') for sonar-guided navigation amidst multiple obstacles.

DTIC

*Bats; Targets; Very Large Scale Integration*

**20080002651** Adelaide Univ., Australia

**Platinum Complexes with Optical Limiting and Related Non-linear Optical and Electronic Properties**

Bruce, Michael; Nov 2007; 6 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0130

Report No.(s): AD-A473849; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project consisted of applying several synthetic approaches, some derived from model studies of molecular wires, to the production of several novel types of platinum-alkynyl complexes.

DTIC

*Electrical Properties; Nonlinear Optics; Nonlinearity; Optical Properties; Platinum*

**20080002886** Texas Univ., Austin, TX USA

**Strategic Partnership for Research in Nanotechnology**

Barbara, Paul F; Aug 1, 2006; 8 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0331

Report No.(s): AD-A473864; AFRL-SR-AR-TR-07-0477; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report discusses researchers working at The University of Texas at Austin whose work has been possible through the Strategic Partnership in Nanotechnology (SPRING) grant. These researchers have either received support directly from awarded funds or used equipment purchased through this grant. The research can be broken into two research areas 'Nanotechnology for Energy Needs' and 'Nanoelectronics'. Highlights of both projects are outlined below. The SPRING award also made a large number of instrument purchases possible. Much of this equipment is housed in the SPRING/KECK clean room facility which is an open facility serving the University of Texas at Austin.

DTIC

*Nanotechnology; Microelectronics; Instruments*

**20080002906** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Transformational Element Level Arrays (TELA) Testbed (Preprint)**

Dalrymple, Thomas; Buck, Jonathan; Buxa, Peter; McCann, John; Neidhard, Robert; Scalzi, Gary; Shreffler, Caleb; Spendley, Dan; Watson, Paul; Sep 2007; 27 pp.; In English

Contract(s)/Grant(s): Proj-7622

Report No.(s): AD-A473492; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473492>

The Air Force is in need of antenna technologies to support surveillance needs in a complex Radio Frequency (RF) environment. Requirements dictate the need to find weak and strong emitters simultaneously over broad bandwidth, while resolving emitter data such as angle of arrival and time of arrival for signal identification and tracking. Previous work at AFRL has resulted in many technologies that support these needs. Many components exist today that were only theoretical a few years ago, such as phased array antennas that support 10:1 bandwidth, broadband MMIC components, and miniaturized digital receivers. An effort is underway at AFRL to develop systems combining these elements, resulting in wideband phased arrays encompassing multiple receiver channels and capable of forming multiple beams through digital beamforming. The key elements of this effort revolve around three key areas: RF modeling, system integration, and system testing. The TELA Testbed allows for the integration of these technologies as a system that can be tested and verified through modeling. The ultimate goal is a broadband aperture simultaneously supporting EW, communications, and multiple radar modes. This approach will lead to reduced size, cost, weight, and power consumption while serving multiple simultaneous users with minimal impact on an airframe.

DTIC

*Phased Arrays; Antenna Design; Digital Systems*



**20080012203** Radio Corp. of America, New York, NY USA

**Reduction of hunting in synchronous motor**

Clurman, Stanley Paul, Inventor; October 26, 1976; 15 pp.; In English

Patent Info.: Filed April 20, 1972; US-PATENT-3,988,653; US-PATENT-APPL-SN-245909; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012203>

Passive or active networks responsive to changes in motor drive current alter the motor drive voltage or phase to damp hunting of the motor.

Official Gazette of the U.S. Patent and Trademark Office

*Electric Potential; Synchronous Motors*

**20080012204** Wisconsin Alumni Research Foundation, Madison, WI USA

**Resistive neuristor junctions**

Reible, Stanley A., Inventor; September 7, 1976; 7 pp.; In English

Contract(s)/Grant(s): NGR-50-002-160

Patent Info.: Filed September 30, 1974; US-PATENT-3,979,602; US-PATENT-APPL-SN-510646; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012204>

A neuristor R-junction is provided by coupling neuristor lines by paths of varying resistance so that a pulse being propagated on one line when coupled to a portion of the second line through a relatively high resistive path will place the second line in the refractory mode thus preventing the propagation of a pulse through that portion of second line; however the same pulse coupled to another portion of the second line through a lower resistance path will cause a pulse to be produced in the second line and propagated in that portion of second line which is not in the refractory mode. Various logic and storage circuits are included in the disclosure.

Official Gazette of the U.S. Patent and Trademark Office

*Neuristors; Junctions*

**20080012205** Rockwell International Corp., El Segundo, CA USA

**Sense circuit arrangement**

Bohning, Oliver D., Inventor; September 7, 1976; 6 pp.; In English

Contract(s)/Grant(s): NAS1-12435

Patent Info.: Filed November 14, 1974; US-PATENT-3,979,600; US-PATENT-APPL-SN-523598; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012205>

A unique, two-node sense circuit is disclosed. The circuit includes a bridge comprised of resistance elements and a differential amplifier. The two-node circuit is suitably adapted to be arranged in an array comprised of a plurality of discrete bridge-amplifiers which can be selectively energized. The circuit is arranged so as to form a configuration with minimum power utilization and a reduced number of components and interconnections therebetween.

Official Gazette of the U.S. Patent and Trademark Office

*Circuits; Differential Amplifiers*

**20080012209** Rockwell International Corp., El Segundo, CA USA

**Process for making a multilayer interconnect system**

Zachry, Clyde L., Inventor; Niedzwiecke, Andrew J., Inventor; May 4, 1976; 5 pp.; In English

Contract(s)/Grant(s): NAS1-12435

Patent Info.: Filed June 30, 1975; US-PATENT-3,953,924; US-PATENT-APPL-SN-591591; No Copyright; Avail.: CASI:

A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012209>

A process for making an interconnect system for a multilayer circuit pattern. The interconnect system is formed having minimized through-hole space consumption so as to be suitable for high density, closely meshed circuit patterns.

Official Gazette of the U.S. Patent and Trademark Office

*Electric Connectors; Circuits*

**20080012211** Rockwell International Corp., El Segundo, CA USA

**Driver circuit**

Matsumoto, Raymond T., Inventor; Higashi, Stanley T., Inventor; April 20, 1976; 7 pp.; In English

Contract(s)/Grant(s): NAS1-12228

Patent Info.: Filed June 5, 1974; US-PATENT-3,952,212; US-PATENT-APPL-SN-476741; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012211>

A driver circuit which has low power requirements, a relatively small number of components and provides flexibility in output voltage setting. The driver circuit comprises, essentially, two portions which are selectively activated by the application of input signals. The output signal is determined by which of the two circuit portions is activated. While each of the two circuit portions operates in a manner similar to silicon controlled rectifiers (SCR), the circuit portions are on only when an input signal is supplied thereto.

Official Gazette of the U.S. Patent and Trademark Office

*Circuits; Electric Potential; Flexibility*

**20080012217** Rockwell International Corp., El Segundo, CA USA

**Bubble domain circuit organization**

Chen, Thomas T., Inventor; June 28, 1977; 9 pp.; In English

Contract(s)/Grant(s): NAS1-12435

Patent Info.: Filed September 18, 1975; US-PATENT-4,032,905; US-PATENT-APPL-SN-614401; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012217>

An on-chip bubble domain circuit organization. One or more storage registers are connected to a propagation path whereby data in the form of magnetic bubble domains (bubbles) may be transferred into and out of the storage registers. The propagation path includes a generator for producing the initial bubbles which are expanded into any desired number of new bubbles by a unique multiple output replicator. A unique input decoder is utilized to determine to which storage register the bubbles from the replicator will be directed along the propagation path. Those bubbles not selected may be annihilated. An output decoder utilizing essentially the same decoding scheme as the input decoder, selectively receives bubbles from the storage register. A transfer and replicate switch is utilized between the storage register and output decoder to selectively transfer bubbles to the output decoder. The output decoder may collapse all of the bubbles from certain storage registers so that only the information from the selected storage register reaches the detector. The detectors in turn produce the chip output signal. External control electronics are utilized to control the selective operation of the various devices utilized in the propagation path.

Official Gazette of the U.S. Patent and Trademark Office

*Bubbles; Circuits; Decoders*

**20080012218** Radio Corp. of America, New York, NY USA

**Holographic recording medium employing a photoconductive layer and a low molecular weight microcrystalline polymeric layer**

Gange, Robert Allen, Inventor; June 28, 1977; 5 pp.; In English

Patent Info.: Filed October 8, 1975; US-PATENT-4,032,338; US-PATENT-APPL-SN-620749; No Copyright; Avail.: CASI:

A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012218>

A holographic recording medium comprising a conductive substrate, a photoconductive layer and an electrically alterable layer of a linear, low molecular weight hydrocarbon polymer has improved fatigue resistance. An acrylic barrier layer can be interposed between the photoconductive and electrically alterable layers.

Official Gazette of the U.S. Patent and Trademark Office

*Crystallinity; Holography; Hydrocarbons; Low Molecular Weights; Microcrystals; Photoconductivity*

**20080012219** Radio Corp. of America, New York, NY USA

**Tri-state logic circuit**

Pryor, Richard Lee, Inventor; June 14, 1977; 6 pp.; In English

Contract(s)/Grant(s): NAS8-29072

Patent Info.: Filed February 13, 1976; US-PATENT-4,029,971; US-PATENT-APPL-SN-657838; No Copyright; Avail.: CASI: [A02](#), Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012219>

A line driver including a pair of complementary transistors having their conduction paths serially connected between an operating and a reference potential and their bases connected through a first switch to a signal input terminal. A second switch is connected between the common base connection and the common connection of the conduction paths. With the second switch open and the first closed, an output voltage, responsive to the input signal, corresponding to first or second binary values is obtained. When the second switch is closed and the first opened, the transistor pair is turned off, disconnecting the line driver from its load, thereby providing tri-state logic operation.

Official Gazette of the U.S. Patent and Trademark Office  
*Logic Circuits; Switches; Transistors; Electric Potential*

**20080012223** Hughes Aircraft Co., Culver City, CA USA

**Reflective liquid crystal light valve with hybrid field effect mode**

Boswell, Donald D., Inventor; Grinberg, Jan, Inventor; Jacobson, Alexander D., Inventor; Myer, Gary D., Inventor; April 26, 1977; 14 pp.; In English

Contract(s)/Grant(s): NAS5-23192

Patent Info.: Filed March 8, 1976; US-PATENT-4,019,807; US-PATENT-APPL-SN-664776; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012223>

There is disclosed a high performance reflective mode liquid crystal light valve suitable for general image processing and projection and particularly suited for application to real-time coherent optical data processing. A preferred example of the device uses a CdS photoconductor, a CdTe light absorbing layer, a dielectric mirror, and a liquid crystal layer sandwiched between indium-tin-oxide transparent electrodes deposited on optical quality glass flats. The non-coherent light image is directed onto the photoconductor; this reduces the impedance of the photoconductor, thereby switching the AC voltage that is impressed across the electrodes onto the liquid crystal to activate the device. The liquid crystal is operated in a hybrid field effect mode. It utilizes the twisted nematic effect to create a dark off-state (voltage off the liquid crystal) and the optical birefringence effect to create the bright on-state. The liquid crystal thus modulates the polarization of the coherent read-out or projection light responsively to the non-coherent image. An analyzer is used to create an intensity modulated output beam.

Official Gazette of the U.S. Patent and Trademark Office

*Image Processing; Light Valves; Liquid Crystals; Real Time Operation; Electric Potential; Photoconductors*

**20080012224** Rockwell International Corp., El Segundo, CA USA

**Continuous data stream FIFO magnetic bubble domain shift register**

Chen, Thomas T., Inventor; May 17, 1977; 6 pp.; In English

Contract(s)/Grant(s): NAS1-12435

Patent Info.: Filed October 31, 1975; US-PATENT-4,024,517; US-PATENT-APPL-SN-627737; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012224>

There is described a simple first-in, first out (FIFO) magnetic bubble domain shift register which has continuous data storage capability. In a preferred embodiment, two parallel detector branches are associated with a main storage loop. The bubbles in the storage loop are replicated toward each detector branch by passive replicators in the storage loop. Annihilators associated with each of the replicators and each of the detectors are arranged an appropriate distance from the replicators so that selective energization of the annihilators permits certain bits to propagate to one detector and other bits to propagate to the other detector. Connection of the detectors in an appropriate bridge circuit permits full data rate reclamation.

Official Gazette of the U.S. Patent and Trademark Office

*Bubbles; Data Flow Analysis; Data Storage; Magnetic Domains; Shift Registers*

**20080012227** TRW, Inc., Redondo Beach, CA USA

**Multiple feedback control apparatus for power conditioning equipment**

Biess, John, Inventor; Yu, Yuan, Inventor; March 22, 1977; 7 pp.; In English

Patent Info.: Filed December 30, 1974; US-PATENT-4,013,939; US-PATENT-APPL-SN-537294; No Copyright; Avail.:  
CASI: [A02](#), Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012227>

An improved feedback control system to govern the cyclic operation of the power switch of a non-dissipative power conditioning equipment. The apparatus includes two or three control loops working in unison. The first causes the output DC level to be compared with a reference, and the error amplified for control purposes. The second utilizes the AC component of the voltage across the output filter inductor or the current through the output filter capacitor, and the third loop senses the output transients.

Official Gazette of the U.S. Patent and Trademark Office

*Dissipation; Feedback Control; Power Conditioning; Switches; Electric Potential*

**20080012229** NASA, Washington, DC USA; Virginia Univ., Charlottesville, VA USA

**Detecting the presence of microorganisms**

Wilkins, Judd R., Inventor; Stoner, Glenn E., Inventor; February 22, 1977; 14 pp.; In English

Patent Info.: Filed December 16, 1975; US-PATENT-4,009,078; US-PATENT-APPL-SN-641279; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012229>

The presence of microorganisms in a sample is determined by culturing microorganisms in a growth medium which is in contact with a measuring electrode and a reference electrode and detecting a change in potential between the electrodes caused by the presence of the microorganisms in the medium with a high impedance potentiometer.

Official Gazette of the U.S. Patent and Trademark Office

*Detection; Electrodes; Microorganisms; Impedance*

**20080012230** Rockwell International Corp., El Segundo, CA USA

**Passive chevron replicator**

Oeffinger, Thomas R., Inventor; Tocci, Leonard R., Inventor; November 1, 1977; 5 pp.; In English

Contract(s)/Grant(s): NAS1-12981

Patent Info.: Filed October 20, 1975; US-PATENT-4,056,813; US-PATENT-APPL-SN-623681; No Copyright; Avail.:

CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012230>

There is described a passive replicator device to be used in magnetic bubble domain systems. The replicator is passive, i.e., does not require an active element such as a current source or the like, and both propagates and replicates bubble domains. In a preferred embodiment, the replicator uses chevron type elements arranged in an appropriate pattern so as to interact with a pair of propagation paths wherein bubble domains are propagated. A bubble in one propagation path is routinely transferred therealong and, concurrently, replicated by the instant device into another propagation path. A plurality of elements arranged in juxtaposition to the chevrons assists in controlling the propagation of the bubbles through the respective propagation paths and, at the appropriate time, provides a cutting action wherein a bubble which is elongated between the chevrons of the two propagation paths is split into two separate bubbles.

Official Gazette of the U.S. Patent and Trademark Office

*Bubbles; Magnetic Domains; Cutting*

**20080012231** California Inst. of Tech., Pasadena, CA USA

**X-ray exposure sensor and controller**

Berdahl, C. Martin, Inventor; October 11, 1977; 8 pp.; In English

Patent Info.: Filed June 11, 1976; US-PATENT-4,053,774; US-PATENT-APPL-SN-695175; No Copyright; Avail.:

CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012231>

An exposure controller for x-ray equipment is provided, which comprises a portable and accurate sensor which can be placed adjacent to and directly beneath the area of interest of an x-ray plate, and which measures the amount of exposure received by that area, and turns off the x-ray equipment when the exposure for the particular area of interest on the x-ray plate reaches the value which provides an optimal x-ray plate.

Official Gazette of the U.S. Patent and Trademark Office

*Controllers; Exposure; X Ray Detectors; X Rays*

**20080012239** Rockwell International Corp., El Segundo, CA USA

**Ferroelectric liquid crystal display**

York, Paul K., Inventor; August 9, 1977; 11 pp.; In English

Contract(s)/Grant(s): NAS1-12228

Patent Info.: Filed April 21, 1975; US-PATENT-4,040,720; US-PATENT-APPL-SN-570115; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012239>

A ferroelectric liquid crystal display device employs capacitance spoiling layers to minimize unneeded capacitances created by crossovers of X and Y address lines and to accurately define desired capacitances. The spoiler layers comprise low dielectric constant layers which space electrodes from the ferroelectric at crossover points where capacitance is not needed for device operation.

Official Gazette of the U.S. Patent and Trademark Office

*Capacitance; Crossovers; Display Devices; Ferroelectricity; Liquid Crystals*

**20080012242** TRW, Inc., Redondo Beach, CA USA

**Multiple high voltage output DC-to-DC power converter**

Cronin, Donald L., Inventor; Farber, Bertrand F., Inventor; Gehm, Hartmut K., Inventor; Goldin, Daniel S., Inventor; July 5, 1977; 4 pp.; In English

Patent Info.: Filed June 9, 1975; US-PATENT-4,034,280; US-PATENT-APPL-SN-585429; No Copyright; Avail.: CASI:

A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012242>

Disclosed is a multiple output DC-to-DC converter. The DC input power is filtered and passed through a chopper preregulator. The chopper output is then passed through a current source inverter controlled by a squarewave generator. The resultant AC is passed through the primary winding of a transformer, with high voltages induced in a plurality of secondary windings. The high voltage secondary outputs are each solid-state rectified for passage to individual output loads. Multiple feedback loops control the operation of the chopper preregulator, one being responsive to the current through the primary winding and another responsive to the DC voltage level at a selected output.

Official Gazette of the U.S. Patent and Trademark Office

*High Voltages; Power Converters; Voltage Converters (DC to DC)*

**20080012250** Radio Corp. of America, New York, NY USA

**Photovoltaic device having an extended PN junction**

D'Aiello, Robert Vincent, Inventor; September 5, 1978; 5 pp.; In English

Patent Info.: Filed November 1, 1976; US-PATENT-4,112,457; US-PATENT-APPL-SN-737915; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012250>

A photovoltaic device having essentially only a body of semiconductor material having a first region of one conductivity type in contact with a second region of the opposite conductivity type, forming a portion of the device PN junction therebetween. A plurality of pocket regions of the same conductivity type as the first region extend into the second region thereby further defining a portion of the PN junction in the second region.

Official Gazette of the U.S. Patent and Trademark Office

*P-N Junctions; Semiconductors (Materials)*

**20080012256**

**System-state and operating condition sensitive control method and apparatus for electric power delivery systems**

Burns, III, William Wesley, Inventor; Wilson, Thomas George, Inventor; April 11, 1978; 39 pp.; In English

Patent Info.: Filed June 7, 1977; US-PATENT-4,084,103; US-PATENT-APPL-SN-804225; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012256>

This invention provides a method and apparatus for determining a precise switching sequence for the power switching elements of electric power delivery systems of the on-off switching type and which enables extremely fast transient response, precise regulation and highly stable operation. The control utilizes the values of the power delivery system power handling network components, a desired output characteristic, a system timing parameter, and the externally imposed operating

conditions to determine where steady state operations should be in order to yield desired output characteristics for the given system specifications. The actual state of the power delivery system is continuously monitored and compared to a state-space boundary which is derived from the desired equilibrium condition, and from the information obtained from this comparison, the system is moved to the desired equilibrium condition in one cycle of switching control. Since the controller continuously monitors the power delivery system's externally imposed operating conditions, a change in the conditions is immediately sensed and a new equilibrium condition is determined and achieved, again in a single cycle of switching control.

Official Gazette of the U.S. Patent and Trademark Office

*Electric Power Supplies; Sensitivity; Switching; Switching Circuits*

**20080012259** Rockwell International Corp., El Segundo, CA USA

**Multi-segment detector**

George, Peter K., Inventor; March 7, 1978; 5 pp.; In English

Contract(s)/Grant(s): NAS1-12981

Patent Info.: Filed February 2, 1976; US-PATENT-4,078,230; US-PATENT-APPL-SN-654677; No Copyright; Avail.:

CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012259>

A plurality of stretcher detector segments are connected in series whereby detector signals generated when a bubble passes thereby are added together. Each of the stretcher detector segments is disposed an identical propagation distance away from passive replicators wherein bubbles are replicated from a propagation path and applied, simultaneously, to the stretcher detector segments. The stretcher detector segments are arranged to include both dummy and active portions thereof which are arranged to permit the geometry of both the dummy and active portions of the segment to be substantially matched.

Official Gazette of the U.S. Patent and Trademark Office

*Bubbles; Stretchers*

**20080012261** Rockwell International Corp., El Segundo, CA USA

**Passive replicator**

George, Peter K., Inventor; Kobayashi, Tsutomu, Inventor; January 3, 1978; 5 pp.; In English

Contract(s)/Grant(s): NAS1-12981

Patent Info.: Filed February 9, 1976; US-PATENT-4,067,003; US-PATENT-APPL-SN-656688; No Copyright; Avail.:

CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012261>

A passive replicator comprising a plurality of elongated bars interposed between an input propagation path and a plurality of output propagation paths.

Official Gazette of the U.S. Patent and Trademark Office

*Bubble Memory Devices; Propagation*

**20080012266** Rockwell International Corp., El Segundo, CA USA

**One-third selection scheme for addressing a ferroelectric matrix arrangement**

Tannas, Jr., Lawrence E., Inventor; September 25, 1979; 10 pp.; In English

Contract(s)/Grant(s): NAS1-12228

Patent Info.: Filed May 15, 1978; US-PATENT-4,169,258; US-PATENT-APPL-SN-905914; No Copyright; Avail.:

CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012266>

An improved scheme for selectively addressing a matrix arrangement comprised of ferroelectrics having x and y orthogonally disposed intersecting lines. A one-third selection scheme is utilized that includes normalized selection signals having amplitudes:  $V_{sub.x} = 0$ ;  $V_{sub.x} = 2/3$ ;  $V_{sub.y} = 1/3$ ; and  $V_{sub.y} = 1$ , which signals can be applied to the intersection of an x and y-line. The instant selection scheme minimizes both hysteresis creep and the cross-coupling voltage between x and y-lines to prevent undesirable hysteresis switching of the ferroelectric matrix arrangement.

Official Gazette of the U.S. Patent and Trademark Office

*Ferroelectricity; Hysteresis; Electric Potential*

**20080012268** California Inst. of Tech., Pasadena, CA USA

**Voltage-current-power meter for photovoltaic solar arrays**

Ross, Ronald G., Inventor; July 31, 1979; 11 pp.; In English

Patent Info.: Filed July 22, 1977; US-PATENT-4,163,194; US-PATENT-APPL-SN-818122; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012268>

A meter is disclosed for measuring the voltage, current, and power (VIP) parameters of a photovoltaic solar array, or array module, under sunlight operating conditions utilizing a variable load connected across the array and controlled by a voltage regulator which responds to the difference between the output voltage of the array and a programmed test voltage from a source which generates a single ramp voltage for measuring and recording current as a function of voltage, repeated ramp voltages at a high rate for peak output measurements or a DC voltage for VIP measurements at selected points on the I-V characteristic curve of the array. The voltage signal from a current sensing element, such as a shunt resistor in series with the variable load, is compared with the output current of a reference solar cell to provide a normalizing signal to be added to the signal from the current-sensing element in order to provide a record of array current as a function of array voltage, i.e., for all load conditions from short circuit to open circuit. As the normalized current is thus measured, an analog multiplier multiplies the array voltage and normalized current to provide a measurement of power. Switches are provided to selectively connect the power, P, current, I, or voltage, V, to a meter, directly or through a peak detector. At the same time any one of the parameters V, I and P may be recorded as a function of any other parameter.

Official Gazette of the U.S. Patent and Trademark Office

*Electric Potential; Loads (Forces); Photovoltaic Cells; Solar Arrays*

**20080012271** Westinghouse Electric Corp., Pittsburgh, PA USA

**DC static switch circuit with power saving feature**

Baker, Donal E., Inventor; May 29, 1979; 6 pp.; In English

Contract(s)/Grant(s): NAS9-14000

Patent Info.: Filed April 13, 1977; US-PATENT-4,156,837; US-PATENT-APPL-SN-787233; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012271>

A main switch transistor is provided with a base drive circuit to vary the base drive current in accordance with load current to minimize power dissipation. Base drive may also be limited to a maximum for overload current limiting.

Official Gazette of the U.S. Patent and Trademark Office

*Circuits; Loads (Forces); Switches; Transistors*

**20080012272** NASA, Washington, DC USA

**EKG and ultrasonoscope display**

Lee, Robert D., Inventor; May 15, 1979; 12 pp.; In English

Patent Info.: Filed January 17, 1977; US-PATENT-4,154,230; US-PATENT-APPL-SN-759965; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012272>

A system is disclosed which permits simultaneous display of an EKG waveform in real time in conjunction with a two-dimensional cross-sectional image of the heart, so that the EKG waveform can be directly compared with dimensional changes in the heart. The apparatus of the invention includes an ultrasonoscope for producing a C-scan cross-sectional image of the heart. An EKG monitor circuit along with EKG logic circuitry is combined with the ultrasonoscope circuitry to produce on the same oscilloscope screen a continuous vertical trace showing the EKG waveform simultaneously with the heart image. The logic circuitry controls the oscilloscope display such that the display of both heart and EKG waveforms occurs on a real time basis.

Official Gazette of the U.S. Patent and Trademark Office

*Display Devices; Electrocardiography; Heart; Real Time Operation; Waveforms; Oscilloscopes*

**20080012278** International Telephone and Telegraph Corp., New York, NY USA

**Method of making conductive elastomer connector**

Alonso, Oscar, Inventor; December 23, 1980; 5 pp.; In English

Patent Info.: Filed February 21, 1979; US-PATENT-4,240,198; US-PATENT-APPL-SN-013255; No Copyright; Avail.: CASI: A01, Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012278>

An electrical connector in which conductive rubber rods are mounted in a metal substrate covered by a nonconductive layer. The rods extend above and below the upper and lower surfaces, respectively, of the substrate for electrically interconnecting conductive traces on a pair of electronic components. A method for making the connector is disclosed.

Official Gazette of the U.S. Patent and Trademark Office

*Connectors; Elastomers; Electric Connectors; Rods; Rubber; Substrates*

**20080012281** California Inst. of Tech., Pasadena, CA USA

**Thin film memory matrix using amorphous and high resistive layers**

Thakoor, Anilkumar P., Inventor; Lambe, John, Inventor; Moopen, Alexander, Inventor; October 24, 1989; 17 pp.; In English  
Patent Info.: Filed April 29, 1986; US-PATENT-4,876,668; US-PATENT-APPL-SN-857076; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012281>

Memory cells in a matrix are provided by a thin film of amorphous semiconductor material overlaid by a thin film of resistive material. An array of parallel conductors on one side perpendicular to an array of parallel conductors on the other side enable the amorphous semiconductor material to be switched in addressed areas to be switched from a high resistance state to a low resistance state with a predetermined level of electrical energy applied through selected conductors, and thereafter to be read out with a lower level of electrical energy. Each cell may be fabricated in the channel of an MIS field-effect transistor with a separate common gate over each section to enable the memory matrix to be selectively blanked in sections during storing or reading out of data. This allows for time sharing of addressing circuitry for storing and reading out data in a synaptic network, which may be under control of a microprocessor.

Official Gazette of the U.S. Patent and Trademark Office

*Computer Storage Devices; Memory (Computers); Thin Films; Amorphous Semiconductors*

**20080012284**

**Woven-grid sealed quasi-bipolar lead-acid battery construction and fabricating method**

Rippel, Wally E., Inventor; October 17, 1989; 19 pp.; In English

Patent Info.: Filed April 14, 1988; US-PATENT-4,874,681; US-PATENT-APPL-SN-181745; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012284>

A quasi-bipolar lead-acid battery construction includes a plurality of bipolar cells disposed in side-by-side relation to form a stack, and a pair of monopolar plates at opposite ends of the stack, the cell stack and monopolar plates being contained within a housing of the battery. Each bipolar cell is loaded with an electrolyte and composed of a bipolar electrode plate and a pair of separator plates disposed on opposite sides of the electrode plate and peripherally sealed thereto. Each bipolar electrode plate is composed of a partition sheet and two bipolar electrode elements folded into a hairpin configuration and applied over opposite edges of the partition sheet so as to cover the opposite surfaces of the opposite halves thereof. Each bipolar electrode element is comprised of a woven grid with a hot-melt strip applied to a central longitudinal region of the grid along which the grid is folded into the hairpin configuration, and layers of negative and positive active material pastes applied to opposite halves of the grid on opposite sides of the central hot-melt strip. The grid is made up of strands of conductive and non-conductive yarns composing the respective transverse and longitudinal weaves of the grid. The conductive yarn has a multi-stranded glass core surrounded and covered by a lead sheath, whereas the non-conductive yarn has a multi-stranded glass core surrounded and covered by a thermally activated sizing.

Official Gazette of the U.S. Patent and Trademark Office

*Bipolarity; Fabrication; Lead Acid Batteries*

**20080012286** United Technologies Corp., East Hartford, CT USA

**Electric power distribution and load transfer system**

Bradford, Michael P., Inventor; Parkinson, Gerald W., Inventor; Grant, Ross M., Inventor; October 10, 1989; 9 pp.; In English  
Contract(s)/Grant(s): NAS2-11058



Patent Info.: Filed January 20, 1988; US-PATENT-RE33,087; US-PATENT-APPL-SN-146057; No Copyright; Avail.: CASI: [A02](#), Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012286>

A power distribution system includes a plurality of power sources and load transfer units including transistors and diodes connected in series and leading to a common power output, each of the transistors being controller switchable subject to voltage levels of the respective input and output sides of said transistors, and the voltage and current level of said common power output. The system is part of an interconnection scheme in which all but one of the power sources is connected to a single load transfer unit, enabling the survival of at least a single power source with the failure of one of the load transfer units.

Official Gazette of the U.S. Patent and Trademark Office

*Electric Power Transmission; Loads (Forces)*

**20080012287** California Inst. of Tech., Pasadena, CA USA

**Current collector for AMTEC**

Williams, Roger M., Inventor; October 3, 1989; 13 pp.; In English

Patent Info.: Filed August 6, 1987; US-PATENT-4,871,626; US-PATENT-APPL-SN-082888; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012287>

An electrode having higher power output is formed of an open mesh current collector such as expanded nickel covering an electrode film applied to a tube of beta-alumina solid electrolyte (BASE). A plurality of cross-members such as spaced, parallel loops of molybdenum metal wire surround the BASE tube. The loops are electrically connected by a bus wire. As the AMTEC cell is heated, the grid of expanded nickel expands more than the BASE tube and the surrounding loop of wire and become diffusion welded to the electrode film and to the wire loops.

Official Gazette of the U.S. Patent and Trademark Office

*Electrodes; Solid Electrolytes; Metal Films; Electric Current*

**20080012298** Ensci, Inc., Woodland Hills, CA USA

**Battery element and method for making same**

Clough, Thomas J., Inventor; Pinsky, Naum, Inventor; August 29, 1989; 12 pp.; In English

Patent Info.: Filed November 23, 1987; US-PATENT-4,861,689; US-PATENT-APPL-SN-123896; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012298>

In a method for producing a battery element useful as at least a positive plate in a lead-acid battery, the element comprising a fluid impervious, electrically conductive matrix having mutually opposing first and second surfaces and positive active electrode material associated with the first surface of the matrix, the improvement which comprises: conditioning the first surface to enhance the association of the positive active electrode material and the first surface; and applying and associating the positive active electrode material to the first surface.

Official Gazette of the U.S. Patent and Trademark Office

*Electrodes; Lead Acid Batteries*

**20080012299** California Inst. of Tech., Pasadena, CA USA

**Spiral configuration of electrodes and dielectric material for sensing an environmental property**

Laue, Eric G., Inventor; Stephens, James B., Inventor; August 15, 1989; 5 pp.; In English

Patent Info.: Filed December 31, 1987; US-PATENT-4,858,063; US-PATENT-APPL-SN-140295; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012299>

A reliable moisture-indicating capacitive sensor is provided with wire electrodes at least one of which includes a coating of moisture-absorbing dielectric material by spirally twisting the wire electrodes about each other, thereby establishing a pair of electrodes in contact with opposite surfaces of a layer of dielectric material, and assuring consistent contact of each electrode with the dielectric material despite changes in environmental conditions.

Official Gazette of the U.S. Patent and Trademark Office

*Moisture; Dielectrics; Electrodes*

**20080012302** Toledo Univ., Toledo, OH USA

**Cascaded resonant bridge converters**

Stuart, Thomas A., Inventor; August 1, 1989; 7 pp.; In English

Contract(s)/Grant(s): NAG3-708

Patent Info.: Filed August 1, 1988; US-PATENT-4,853,832; US-PATENT-APPL-SN-226941; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012302>

A converter for converting a low voltage direct current power source to a higher voltage, high frequency alternating current output for use in an electrical system where it is desired to use low weight cables and other circuit elements. The converter has a first stage series resonant (Schwarz) converter which converts the direct current power source to an alternating current by means of switching elements that are operated by a variable frequency voltage regulator, a transformer to step up the voltage of the alternating current, and a rectifier bridge to convert the alternating current to a direct current first stage output. The converter further has a second stage series resonant (Schwarz) converter which is connected in series to the first stage converter to receive its direct current output and convert it to a second stage high frequency alternating current output by means of switching elements that are operated by a fixed frequency oscillator. The voltage of the second stage output is controlled at a relatively constant value by controlling the first stage output voltage, which is accomplished by controlling the frequency of the first stage variable frequency voltage controller in response to second stage voltage. Fault tolerance in the event of a load short circuit is provided by making the operation of the first stage variable frequency voltage controller responsive to first and second stage current limiting devices. The second stage output is connected to a rectifier bridge whose output is connected to the input of the second stage to provide good regulation of output voltage wave form at low system loads.

Official Gazette of the U.S. Patent and Trademark Office

*Converters; Electrical Engineering; Direct Current*

**34**

**FLUID MECHANICS AND THERMODYNAMICS**

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

**20080000573** Northrop Grumman Corp., El Segundo, CA USA

**Air Vehicle Technology Integration Program (AVTIP). Delivery Order 0020: Prediction of Manufacturing Tolerances for Laminar Flow, Task 6**

Bender, Anne M; Drake, Aaron; Sep 2006; 52 pp.; In English

Contract(s)/Grant(s): F33615-00-D-3054-0020; Proj-A071

Report No.(s): AD-A472336; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ultimate goal of the MEATLOAF study is to develop generalized criteria for the allowable size of an excrescence on a laminar flow wing to prevent premature transition. A salient feature of the study is the nondimensionalization of the critical parameters such that the results are applicable to future work and not specific to a particular airframe. Task 1 provided a database of step effects at Reynolds numbers up to approximately  $7.5 \times 10^5$ . Task 6 is the first step towards extending the Reynolds numbers range to chord Reynolds numbers more applicable to aircraft such as Global Hawk for small pressure gradients. The feasibility of additional testing to include the full-range of pressure gradients at these higher Reynolds numbers was assessed. Figures 1-3 show the approximate range of chord Reynolds numbers for the initial testing of Task 6 in comparison to the completed Task 1 testing.

DTIC

*Laminar Flow; Manufacturing; Pressure Gradients*

**20080000999** Utah Univ., Salt Lake City, UT USA

**Multi-Scale Simulation of High Energy Density Ionic Liquids**

Voth, Gregory A; Jun 19, 2007; 13 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0082

Report No.(s): AD-A472626; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472626>

The focus of this AFOSR project was the molecular dynamics (MD) simulation of ionic liquid structure, dynamics, and

interfacial properties, as well as multi-scale descriptions of these novel liquids (e.g., to bridge with fluid mechanics methods). The overall importance of ionic liquids, as well as the challenges for the future in this area, are clearly high priorities for the Air Force advanced propulsion program. During the course of this funding, a highly accurate molecular simulation approach was developed, which included the large effects of electronic polarizability on ionic liquid structure and dynamics. A coarse-grained MD approach was also developed and applied, leading to significant predictions concerning the fundamental behavior of ionic liquids as a function of their chemical composition.

DTIC

*Fluid Mechanics; Liquids; Molecular Dynamics; Simulation*

**20080001004** Naval Ship Research and Development Center, Washington, DC USA

**A Compendium of Resistance, Sinkage and Trim, and Longitudinal Wave Cut Measurements Obtained on Model 5365**

Ratchliffe, Toby; Fullerton, Anne; Rice, James; Walker, Don; Russell, Lauren; Fu, Thomas; Sep 2007; 41 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00140-06-WX-20713; Proj-R6721

Report No.(s): AD-A472635; NSWCCD-50-TR-2007/002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472635>

Model 5365 is a 1/8.25th scale representation of the R/V Athena. This report documents both a new set of resistance, sinkage and trim, and longitudinal wave cut experiments as well as historical calm water resistance and sinkage and trim data which have been obtained on this model over the past few decades. The new resistance data were obtained in October and November of 2006 on Carriage 2 at the Naval Surface Warfare Center, Carderock, Division. In these experiments drag force was measured using both 6-component Kistler gages and a 'traditional' block gage at the tow post location, as well as a Kistler gage located at the grasshopper bracket model attachment point. An in-situ calibration was also performed in order to verify loads at the tow post and grasshopper bracket location when a known load was applied to the system. Video and still digital cameras were also used to qualitatively characterize the wave field during the runs.

DTIC

*Cutting; Longitudinal Waves*

**20080001006** Texas Univ., Austin, TX USA

**DNS for New Applications of Surface Textures and MEMS Actuators for Turbulent Boundary Layer Control**

Goldstein, David B; Nov 30, 2006; 6 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0176

Report No.(s): AD-A472644; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472644>

As a two year project related to our earlier AFOSR work, we examined the use of surface textures to suppress the growth of turbulent spots during the later stages of boundary layer transition. The textures are small and closely spaced and hence require detailed direct numerical simulation of the near surface flow to capture the physics. The work emphasized the fundamental nature of that flow/texture interaction. This project primarily involved the application of our pre-existing computational techniques and software but did require the alteration of the code to handle a boundary layer and to run with high spatial resolution on a parallel processor. The possible applications to boundary layer control are suggested in Background while the section called Proposal Objectives reviews the approaches considered.

DTIC

*Actuators; Boundary Layer Control; Computational Fluid Dynamics; Direct Numerical Simulation; Microelectromechanical Systems; Textures; Turbulent Boundary Layer*

**20080001013** Woods Hole Oceanographic Inst., MA USA

**Influence of Hydrodynamics on the Larval Supply to Hydrothermal Vents on the East Pacific Rise**

Adams, Diane K; Jun 2007; 167 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): OCE0424953; OCE9712233

Report No.(s): AD-A472655; MIT/WHOI-2007-16; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472655>

Examination of the scales at which larval supply varies spatially and temporally, and correlation with concurrent physical observations can provide insights into larval transport mechanisms that contribute to structuring marine benthic communities.

In order to facilitate field studies, this thesis first provides new morphological and genetic identifications for hydrothermal vent gastropod larvae along the northern East Pacific Rise. Daily and weekly variability in the supply of hydrothermal vent gastropod larvae to two hydrothermal vents, 1.6 km apart on the East Pacific Rise, were quantified concurrently with current velocity observations. The magnitude and temporal pattern of larval supply differed between vent sites, despite their close proximity. A strong correlation between along-axis flow and daily larval supply suggested that larval supply occurred primarily via along-axis transport between local sources 1-2 km apart. However, weekly larval supply appeared to be driven by larger spatial scales through losses associated with cross-axis flows and the passage of mesoscale eddies. Tracer movement within a quasi-geostrophic eddy model was consistent with the observations of decreased larval supply concurrent with an eddy observed via satellite altimetry. The tracer movement also indicated that deep eddy-induced flow could facilitate a long-distance dispersal event, enhancing dispersal between vents 100s km apart.

DTIC

*Hydrodynamics; Larvae; Vents*

**20080001065** Army Research Lab., Aberdeen Proving Ground, MD USA

**Electrothermal-Chemical Plasma Ignition of Gun-Propelling Charges: The Effect of Pulse Length**

Chang, Lang-Mann; Howard, Stephen L; Sep 2007; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472765; ARL-TR-4253; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472765>

An experimental investigation was conducted on the effect of plasma pulse length on gun-charge ignition. The investigation began with visualization of open-air, capillary-generated plasma jet flows and concluded with plasma interaction with a JA2 propelling charge in a 25-mm gun chamber. The plasma energy utilized by the capillary was about 1.1 kJ. With plasma pulse lengths of 0.3 and 1 ms, the resultant flow fields observed were profoundly different in several areas of importance. Typically, the longer pulse length produced a narrower flow field with a greater penetration into the air. The luminosity in the flow region also remained much longer, although at lower intensity. In a JA2-packed chamber, the overall luminosity was higher with the 0.3-ms pulse length during the early time; however, ignition/combustion of the propellant was not sustained. With the 1-ms pulse length, at the same level of energy input from the capillary, sustained ignition/combustion was achieved. Results conclude that plasma pulse length is of importance in optimizing a plasma ignition system for effective ignition of a charge system using a minimum amount of plasma energy.

DTIC

*Combustion; Energy Transfer; Flow Distribution; Ignition; Length; Plasma Guns; Plasma Heating; Plasmas (Physics)*

**20080001198** Naval Surface Warfare Center, Bethesda, MD USA

**Thrust Breakdown Characteristics of Conventional Propellers**

Black, Scott D; Sep 2007; 51 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 07-1-2125-146

Report No.(s): AD-A472935; NSWCDD-50-TR--2007-064; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Historically, the Burrill diagram has been used early in the propeller design process to estimate the inception of thrust loss due to cavitation. That data was based on a systematic series of propeller tested in a uniform inflow. This report develops an alternative set of curves based on five modern propeller designs to estimate thrust breakdown for both uniform inflow and for a range of non-uniformities.

DTIC

*Cavitation Flow; Marine Propulsion; Propellers*

**20080001689** Federal State Unitary Firm, Moscow, Russia

**Study of Properties of the Microwave Streamer Discharge in a High-Speed Flow of Gas and in Two-Phase Medium**

Khodataev, Kirill V; Aug 1, 2006; 102 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473194; ISTC-REG-2820; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473194>

This report results from a contract tasking Federal State Unitary Firm 'MRTI' of RAS as follows: The contractor will investigate the use of undercritical streamer microwave discharges for ignition of fuel-air mixtures. The system of microwave radiation initiated spark filaments can uniformly fill a volume with streamers of several thousand degrees Kelvin. Thus, quick ignition of fuel-air mixtures over the whole cross-section of the discharge is anticipated. Experimental and theoretical

investigations will be carried out. Effects of variation in radiation field wavelength (2.5 cm to 12.5 cm), relative humidity (up to 100%), in a motionless gas and in a gas flow will be investigated. Spatial and temporal characteristics of the discharges will be documented.

DTIC

*Gas Discharges; Gas Flow; High Speed; Magnetohydrodynamics; Microwaves*

**20080001855** Naval Academy, Annapolis, MD USA

**Simulation and Evaluation of Marine Propeller Crashback Through Computational Fluid Dynamics**

Shearer, Matthew P; May 4, 2007; 67 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473284; USNA-TSPR-358; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Crashback is a maneuver which occurs when a ship or submarine reverses its propeller while traveling forward, slowing or stopping the vessel. This results in unpredictable forces and moments that decrease control and maneuverability. This project utilized computational fluid dynamics (CFD) to model the fluid flow during crashback in hopes of determining the physical causes of the unsteady forces and moments that occur. At the Naval Surface Warfare Center in Carderock, MD, there are two CFD approaches being applied to crashback: a pure Large Eddy Simulation (LES) technique and CRUNCH, which is a hybrid of LES and Reynolds Averaged Navier-Stokes (RANS). The LES approach provides extremely detailed three-dimensional, transient turbulence results but, for now, is limited to an open propeller. CRUNCH can also provide turbulent flow data, but it can be applied to more complex geometries, such as a duct or submarine hull. For this research, results generated with the pure LES technique were utilized due to complications that arose from adapting the CRUNCH model to crashback. There were two distinct aspects to this research. First, the LES results were validated against data from experiments with similar advance ratios (a dimensionless parameter relating propeller rotational speed with axial flow velocity). Mean, root mean square, and standard deviation values of the thrust, torque, and side force from the LES code were compared with those from the experiments to ensure the magnitudes and variations in the resultant loads were similar to experimental data. Spectral analysis was also performed on the thrust, torque, and side force magnitudes and angle to determine whether the resultant oscillation frequencies of the LES results were comparable to the response frequencies found in the experimental data. Once the LES results were shown to be sufficiently accurate, analysis was performed to determine the physical cause of the unsteady forces. Several sets of animations were cre

DTIC

*Computational Fluid Dynamics; Hulls (Structures); Marine Propulsion; Propellers; Simulation; Torque*

**20080002103** NASA Glenn Research Center, Cleveland, OH, USA

**Shear History Extensional Rheology Experiment: A Proposed ISS Experiment**

Hall, Nancy R.; Logsdon, Kirk A.; Magee, Kevin S.; November 2007; 16 pp.; In English; 44th AIAA Aerospace Sciences Meeting and Exhibit, 9-12 Jan. 2006, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNC04GA41G; WBS 516576.08.02

Report No.(s): NASA/TM-2007-214098; AIAA Paper-2006-0524; E-15433; Copyright; Avail.: CASI: [A03](#), Hardcopy

The Shear History Extensional Rheology Experiment (SHERE) is a proposed International Space Station (ISS) glovebox experiment designed to study the effect of preshear on the transient evolution of the microstructure and viscoelastic tensile stresses for monodisperse dilute polymer solutions. Collectively referred to as Boger fluids, these polymer solutions have become a popular choice for rheological studies of non-Newtonian fluids and are the non-Newtonian fluid used in this experiment. The SHERE hardware consists of the Rheometer, Camera Arm, Interface Box, Cabling, Keyboard, Tool Box, Fluid Modules, and Stowage Tray. Each component will be described in detail in this paper. In the area of space exploration, the development of in-situ fabrication and repair technology represents a critical element in evolution of autonomous exploration capability. SHERE has the capability to provide data for engineering design tools needed for polymer parts manufacturing systems to ensure their rheological properties have not been impacted in the variable gravity environment and this will be briefly addressed.

Author

*Rheology; Shear Flow; Rheometers; Polymers; Weightlessness; Viscosity*

**20080002104** NASA Glenn Research Center, Cleveland, OH, USA

**Effects of Thermal Barrier Coatings on Approaches to Turbine Blade Cooling**

Boyle, Robert J.; December 2007; 22 pp.; In English; ASME Gas Turbine Expo 2006, 8-11 May 2006, Barcelona, Spain; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.01.03.08

Report No.(s): NASA/TM-2007-214933; GT2006-91202; E-16110; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002104>

Reliance on Thermal Barrier Coatings (TBC) to reduce the amount of air used for turbine vane cooling is beneficial both from the standpoint of reduced NO<sub>x</sub> production, and as a means of improving cycle efficiency through improved component efficiency. It is shown that reducing vane cooling from 10 to 5 percent of mainstream air can lead to NO<sub>x</sub> reductions of nearly 25 percent while maintaining the same rotor inlet temperature. An analysis is given which shows that, when a TBC is relied upon in the vane thermal design process, significantly less coolant is required using internal cooling alone compared to film cooling. This is especially true for small turbines where internal cooling without film cooling permits the surface boundary layer to remain laminar over a significant fraction of the vane surface.

Author

*Thermal Control Coatings; Turbine Blades; Turbines; Vanes; Nitrogen Oxides; Surface Cooling; Cooling*

**20080002105** NASA Glenn Research Center, Cleveland, OH, USA

**Thermal Analysis on Plume Heating of the Main Engine on the Crew Exploration Vehicle Service Module**

Wang, Xiao-Yen J.; Yuko, James R.; November 2007; 17 pp.; In English; Thermal and Fluids Analysis Workshop (TFAWS) 2007, 10-14 Sep, 2007, Warrensville Heights, OH, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 931164.03.01.02.01

Report No.(s): NASA/TM-2007-215049; TFAWS 07-1012; E-16260; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002105>

The crew exploration vehicle (CEV) service module (SM) main engine plume heating is analyzed using multiple numerical tools. The chemical equilibrium compositions and applications (CEA) code is used to compute the flow field inside the engine nozzle. The plume expansion into ambient atmosphere is simulated using an axisymmetric space-time conservation element and solution element (CE/SE) Euler code, a computational fluid dynamics (CFD) software. The thermal analysis including both convection and radiation heat transfers from the hot gas inside the engine nozzle and gas radiation from the plume is performed using Thermal Desktop. Three SM configurations, Lockheed Martin (LM) designed 604, 605, and 606 configurations, are considered. Design of multilayer insulation (MLI) for the stowed solar arrays, which is subject to plume heating from the main engine, among the passive thermal control system (PTCS), are proposed and validated.

Author

*Computational Fluid Dynamics; Multilayer Insulation; Solar Arrays; Spacecraft Modules; Thermal Analysis; Rocket Exhaust; Plumes; Convective Heat Transfer*

**20080002265** NASA Langley Research Center, Hampton, VA, USA

**Statistical Analysis of the AIAA Drag Prediction Workshop CFD Solutions**

Morrison, Joseph H.; Hemsch, Michael J.; December 03, 2007; 19 pp.; In English; NATO-RTO AVT-147 Symposium on Computational Uncertainty in Military Vehicle Design, 3-6 Dec. 2007, Athens, Greece; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002265>

The first AIAA Drag Prediction Workshop (DPW), held in June 2001, evaluated the results from an extensive N-version test of a collection of Reynolds-Averaged Navier-Stokes CFD codes. The code-to-code scatter was more than an order of magnitude larger than desired for design and experimental validation of cruise conditions for a subsonic transport configuration. The second AIAA Drag Prediction Workshop, held in June 2003, emphasized the determination of installed pylon-nacelle drag increments and grid refinement studies. The code-to-code scatter was significantly reduced compared to the first DPW, but still larger than desired. However, grid refinement studies showed no significant improvement in code-to-code scatter with increasing grid refinement. The third AIAA Drag Prediction Workshop, held in June 2006, focused on the determination of installed side-of-body fairing drag increments and grid refinement studies for clean attached flow on wing alone configurations and for separated flow on the DLR-F6 subsonic transport model. This report compares the transonic cruise prediction results of the second and third workshops using statistical analysis.

Author

*Computational Fluid Dynamics; Navier-Stokes Equation; Transonic Speed; Statistical Analysis*

**20080002266** NASA Langley Research Center, Hampton, VA, USA

**A Perspective on Computational Aerothermodynamics at NASA**

Gnoffo, Peter A.; December 03, 2007; 8 pp.; In English; 16th Australasian Fluid Mechanics Conference, 3-7 Dec. 2007, Queensland, Australia; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 732759.07.05; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002266>

The evolving role of computational aerothermodynamics (CA) within NASA over the past 20 years is reviewed. The presentation highlights contributions to understanding the Space Shuttle pitching moment anomaly observed in the first shuttle flight, prediction of a static instability for Mars Pathfinder, and the use of CA for damage assessment in post-Columbia mission support. In the view forward, several current challenges in computational fluid dynamics and aerothermodynamics for hypersonic vehicle applications are discussed. Example simulations are presented to illustrate capabilities and limitations. Opportunities to advance the state-of-art in algorithms, grid generation and adaptation, and code validation are identified.

Author

*Aerothermodynamics; Algorithms; Computational Fluid Dynamics; Hypersonic Vehicles*

**20080002388** Cornell Univ., Ithaca, NY USA

**Vortex-Induced Vibration: Universal Phenomena in Diverse Systems**

Williamson, Charles H; Oct 2007; 14 pp.; In English

Contract(s)/Grant(s): N00014-04-1-0031

Report No.(s): AD-A473561; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473561>

The long-term goals of the research under this award have been to discover and understand generic phenomena in a whole class of vortex-induced vibration systems. We discover, using novel controlled damping, that the immense scatter in the classical Griffin plot (peak amplitude versus mass-damping) over 3 decades, can now be collapsed beautifully if one renormalises the axes, taking into account the effect of Reynolds number, which was previously not considered. We find, from controlled vibration of a cylinder, using extremely high-resolution variation of parameters, that, for the first time, accurate prediction of vortex-induced vibration is possible by searching for stable solutions with positive excitation. We discover that rising bodies do not vibrate unless their mass falls below a special value, which coincides with critical mass found in VIV studies of elastically mounted bodies. Similar response branches are found for a wide set of VIV systems, and in all studies we find the existence of a critical mass. Our work has formed the basis of a number of comprehensive papers in Journal of Fluid Mechanics and other journals, and has led to an invited review of VIV in Annual Review of Fluid Mechanics (2004). The P.I. has founded and chaired a series of international conferences on Bluff Body Wakes and Vortex-Induced Vibrations (USA in 1998, France in 2000, Australia in 2002, Greece in 2005, Brazil in 2007).

DTIC

*Cylindrical Bodies; Reynolds Number; Vibration; Vortices*

**20080002394** Naval Surface Warfare Center, Bethesda, MD USA

**Axial Waterjet (AxWJ) Model 5662: Hull Resistance and Model-Scale Powering with LDV Nozzle Design**

Cusanelli, Dominic S; Carpenter, Scott A; Sep 2007; 72 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473572; NSWCCD-50-TR-2007/059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473572>

This report is a partial documentation of the first series of model-scale tests conducted 12/06-2/07, to evaluate the Axial Waterjet (AxWJ), Model 5662, on the Joint High Speed Sealift (JHSS) hull platform. This document contains calm water resistance and model-scale powering test results only. Bare hull effective powers were determined for the AxWJ hull at three displacement conditions. Appended effective power was determined for the AxWJ hull with the LDV waterjet nozzles installed, at design displacement. Bare hull and appended effective powers for AxWJ were compared to those of the JHSS Baseline shaft & strut (BSS) hull. Model scale rotor force measurements were recorded for the AxWJ under power. These tests were conducted with waterjet nozzles specifically designed for the purpose of LDV flow survey measurements. During testing, the transom flow was observed to impinge on the nozzle hardware included for LDV measurement purposes, resulting in additional hull drag and power. Detailed powering analysis derived from the LDV and pressure tap measurements, including full-scale powering predictions, will be reported in a separate document.

DTIC

*Hulls (Structures); Hydraulic Jets; Nozzle Design; Nozzles*

**20080002400** Cincinnati Univ., OH USA

**Advanced Neural Network Modeling of Synthetic Jet Flow Fields**

Orkwis, Paul D; Daviaux, Terry; Mar 2006; 17 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0175; F49620-02-0-0092

Report No.(s): AD-A473581; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473581>

The purpose of this research was to continue development of a neural network-based, lumped deterministic source term (LDST) approximation module for modeling synthetic jets in large-scale CFD calculations. The LDST approximation technique developed by the author and his students was employed. The main exploration involved the grid sensitivity of the neural network model. A second task was originally planned on the portability of the approach to other solvers, but interesting developments on the first task prevented that study from being pursued.

DTIC

*Flow Distribution; Jet Flow; Models; Neural Nets*

**20080002545** Air Force Research Lab., Edwards AFB, CA USA

**Thrust Stand Mass Balance Measurements of Hybrid Motor Mass Flow (Postprint)**

Olliges, J D; Killingsworth, M D; Lilly, T C; Ketsdever, A D; Jun 8, 2007; 9 pp.; In English

Contract(s)/Grant(s): Proj-5026

Report No.(s): AD-A473687; AFRL-PR-ED-TP-2007-319; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A novel diagnostic technique has been developed, utilizing the Thrust Stand Mass Balance, to directly measure a time accurate mass flow from a solid-fuel thruster for systems where the mass flow rate is of the same order as the experimental error. The mass flow measurement technique has been verified using an idealized numerical simulation. Two calibration experiments have been performed to assess the dynamic response of the mass balance. First, a set of calibration weights were placed on the mass balance and removed in order to properly characterize the mass balance motion. Second, a known mass flow rate of water was deposited onto the test stand. As a proof of concept experiment, a 3.81cm diameter PMMA/GOx hybrid thruster core was burned and the propellant mass flow was measured. Variations in the GOx flow rate resulted in corresponding variations in the total propellant mass flow as expected, showing the utility of the Thrust Stand Mass Balance as a mass flow measurement device.

DTIC

*Balance; Mass Distribution; Mass Flow; Measurement; Rocket Engines; Thrust Control*

**20080002572** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**An Experimental Investigation Into The Effect Of Plasma On The Flow Features Of An Axisymmetric Jet**

Huffman, Richard E; Oct 2007; 387 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473724; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main goal of the research presented was to determine the differences between a plasma field and neutral field flow structure (both mean and turbulent effects) for varying Mach number. The overall objective was to describe the effect of radio frequency capacitively coupled plasma on the flow features of compressible axisymmetric jets in Nitrogen. Three flows were investigated: perfectly expanded jets, highly underexpanded jets, and jets created by a constant-diameter nozzle which produced developing pipe flow. High subsonic to supersonic pressure ratios were investigated to determine the influence of compressibility. Particle image velocimetry was used to quantify the mean and turbulent fluctuations of velocity in the jet flow field. The tracking of seed particles in rarefied and compressible jets was characterized by comparison with particle models and from mean velocities obtained by molecular tagging velocimetry. Periodic, large scale structures were forced into the jet field and convective velocities were measured by tracking the structures. The plasma fields were measured to characterize the visible light emitted and rotational and vibrational temperatures were obtained by model matching to spectra recorded of the second positive system of diatomic Nitrogen.

DTIC

*Flow Distribution; Mach Number; Magnetohydrodynamic Flow*



**20080002632** Naval Undersea Warfare Center, Newport, RI USA

**Towed Array Hydrodynamic Research in the Naval Research Enterprise Intern Program (NREIP)**

Keith, William L; Cipolla, Kimberly M; Leous, Jane; Scales, Elizabeth; Sep 20, 2007; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473819; NUWC-NPT-TM-07-059; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This memo reproduces a presentation describing the towed array hydrodynamic tests performed by the Naval Undersea Warfare Center (NUWC) Division, Newport, RI, under the Naval Research Enterprise Intern Program. The tests, conducted in June 2007 at the Naval Surface Warfare Center's David Taylor Model Basin in Carderock, MD, were designed to measure the turbulent boundary layer velocity profiles, mean wall shear stress, and wall pressure fluctuations on an experimental towed array. The research objectives, experimental approach, measurement techniques, and preliminary results are provided.

DTIC

*Hydrodynamics; Shear Stress; Turbulent Boundary Layer*

**20080002636** Army Engineer Research and Development Center, Vicksburg, MS USA

**Development of a Simple Soil Moisture Model in the Hydrologic Simulator GSSHA**

Downer, Charles W; Oct 2007; 9 pp.; In English

Report No.(s): AD-A473824; ERDC-TN-SWWRP-07-8; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this System-Wide Water Resources Program (SWWRP) technical note is to describe the development and application of simplified unsaturated zone modeling in the Gridded Surface Subsurface Hydrologic Analysis model (GSSHA) (Downer et al. 2005). This new method was developed to increase the applicability of the GSSHA model to high resolution coupled surface-water/groundwater simulations of large basins that may be limited by excessive simulation times or accuracy of methods of unsaturated zone computations previously available in the model.

DTIC

*Hydraulic Analogies; Simulators; Soil Moisture; Soils*

**20080002654** Ministry of Supply, London, UK

**Viscous and Elastic Properties of Concentrated Solutions of High Polymers. 1. A Suitable Thixoviscometer and Thermostat**

Stainsby, G; Ward, A G; Nov 1949; 33 pp.; In English

Report No.(s): AD-A473858; ERDE-10/R/49; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Object of Investigation. To design a suitable instrument for measuring the viscous and elastic properties of binders which have been used in experiments upon the plastic propellant, this being the first stage in a thorough study of the fundamental rheological properties of those binders.

DTIC

*Elastic Properties; High Polymers; Propellants; Thermostats; Viscosity*

**20080002816** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Non-Reacting and Combusting Flow Investigation of Bluff Bodies in Cross Flow (Postprint)**

Kiel, Barry; Garwick, Kyle; Lynch, Amy; Gord, James R; Meyer, Terrence; Aug 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-3066

Report No.(s): AD-A473728; AFRL-RZ-WP-TP-2007-248; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper is the first in a series of papers studying the behavior of bluff body stabilized flames. In this research a combination of Laser Doppler Velocimetry (LDV), and High Speed Imaging are used to investigate these flames. LDV data taken over several non-combusting operating conditions detail the recirculation zone behind the bluff body as well as the effect of inlet conditions on the Karman Street vortex shedding that occurs. High speed images of combustion and equivalence ratio taken at blow out agree with assertions made by Ozawa (1971) and Zukoski (1957) on the transitional nature of the flame from 'laminar' to 'turbulent' at a Reynolds number of around 15,000. Lean blow out also correlate very well when using the correlation parameter set down by Dezubay (1950). Finally, high speed images also support assertions by Mehta and Soteriou

(2003) Erickson et al. (2006) that under certain conditions Karman Street vortex shedding is not suppressed by momentum and baroclinic effects and are present in the flame near lean blowout.

DTIC

*Bluff Bodies; Combustible Flow; Cross Flow; Flow; Propulsion System Configurations; Propulsion System Performance; Reacting Flow; Reynolds Number*

**20080002818** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Improved Correlations for Augmentor Static Stability (Postprint)**

Kiel, Barry V; Knaus, Darin A; Magari, Patrick J; Hill, Roger W; Phillips, Scott D; Aug 2007; 12 pp.; In English

Contract(s)/Grant(s): Proj-3066

Report No.(s): AD-A473730; AFRL-RZ-WP-TP-2007-245; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Flame stability is critical to the operational performance of combustion systems in propulsion and power generation. Current predictive tools for flame stability are based on decades-old empirical correlations that have limited applicability for modern combustor designs. Recent advances in computational fluid dynamics (CFD) and advanced combustion diagnostics have provided new insight into the fundamental processes that occur in these flows. Reacting-flow CFD has yet to mature to a level where it can be practically applied as a design tool for this problem. This paper describes a new methodology for analyzing flame stability intended to provide designers with a significantly improved near-term predictive capability. Our predictive methodology is based on a Damk?hler number (Da) approach. Simplified CFD calculations are used to calculate relevant flow timescales, and reactor model calculations are used to characterize the important chemical timescales in the system. These timescales are used to form a Da number that is used to determine stability.

DTIC

*Augmentation; Combustion; Correlation; Flames; Stability; Static Stability*

**20080002824** Air Force Research Lab., Wright-Patterson AFB, OH USA

**The Effect of Steady Fluid Motion on One-Dimensional Wave Propagation (Postprint)**

Kiel, Barry; Kashani, Reza; Aug 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-3066

Report No.(s): AD-A473727; AFRL-RZ-WP-TP-2007-247; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Reduced order modeling of thermoacoustic instabilities involves the coupled modeling of the wave propagation in the combustion chamber and the unsteady heat release. In many combustion systems the Mach number is low enough that the effect of the fluid motion on the wave propagation can be ignored. Ignoring the fluid motion results in the use of the wave equation to model the wave motion in the combustion chamber. In a previous paper the momentum and pressure equations were linearized by representing the fluid motion by a steady Mach number. In that research the frequency and phase relationship change as Mach number increases. In this research unsteady fluid motion is considered. The governing equations for momentum and pressure are modeled in SIMULINK and studied using frequency response tools.

DTIC

*Combustion Chambers; Fluid Mechanics; Wave Propagation*

**20080002900** NASA Dryden Flight Research Center, Edwards, CA, USA

**Overview of Experimental Capabilities - Supersonics**

Banks, Daniel W.; November 2007; 17 pp.; In English; ARMD Annual Meeting, 30 Oct. - 1 Nov. 2007, New Orleans, LA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002900>

This viewgraph presentation gives an overview of experimental capabilities applicable to the area of supersonic research. The contents include: 1) EC Objectives; 2) SUP.11: Elements; 3) NRA; 4) Advanced Flight Simulator Flexible Aircraft Simulation Studies; 5) Advanced Flight Simulator Flying Qualities Guideline Development for Flexible Supersonic Transport Aircraft; 6) Advanced Flight Simulator Rigid/Flex Flight Control; 7) Advanced Flight Simulator Rapid Sim Model Exchange; 8) Flight Test Capabilities Advanced In-Flight Infrared (IR) Thermography; 9) Flight Test Capabilities In-Flight Schlieren; 10) Flight Test Capabilities CLIP Flow Calibration; 11) Flight Test Capabilities PFTF Flowfield Survey; 12) Ground Test Capabilities Laser-Induced Thermal Acoustics (LITA); 13) Ground Test Capabilities Doppler Global Velocimetry (DGV); 14)

Ground Test Capabilities Doppler Global Velocimetry (DGV); and 15) Ground Test Capabilities EDL Optical Measurement Capability (PIV) for Rigid/Flexible Decelerator Models.

CASI

*Supersonics; General Overviews; Supersonic Transports; Wind Tunnel Tests; Flight Tests*

**20080012206** Exxon Research and Engineering Co., Linden, NJ USA

**Fuel cell heat and mass plate**

Asher, William J., Inventor; May 18, 1976; 5 pp.; In English

Patent Info.: Filed July 28, 1971; US-PATENT-3,957,535; US-PATENT-APPL-SN-166746; No Copyright; Avail.: CASI:

A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012206>

A novel method and apparatus is provided for controlling heat and mass inventory in a fuel cell. Heat and mass, e.g. water, generated in the cell are removed by heat transfer and capillary action.

Official Gazette of the U.S. Patent and Trademark Office

*Fuel Cells; Heat Transfer; Fluid Flow*

**20080012214** Radio Corp. of America, New York, NY USA

**Passive cooler**

Aronson, Albert Irving, Inventor; June 21, 1977; 6 pp.; In English

Contract(s)/Grant(s): NAS5-20074

Patent Info.: Filed December 11, 1975; US-PATENT-4,030,316; US-PATENT-APPL-SN-639760; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012214>

A three stage passive cooler for use in a spacecraft for cooling an infra-red detector includes a detector mounting cold plate for mounting the detector directly to the telescope optics. The telescope optics collect and direct the infra-red radiation from the earth, for example, to the infra-red detector, and are mounted directly to the spacecraft. The remaining stages of the cooler are mounted with thermal insulators to each other and to the spacecraft at separate locations from the detector mounting cold plate.

Official Gazette of the U.S. Patent and Trademark Office

*Coolers; Cooling; Infrared Detectors; Mounting; Telescopes*

**20080012216** NASA, Washington, DC USA

**Fluid valve with wide temperature range**

Kast, Howard Berdolt, Inventor; January 27, 1976; 6 pp.; In English

Patent Info.: Filed July 8, 1974; US-PATENT-3,934,612; US-PATENT-APPL-SN-486471; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012216>

A fluid valve suitable for either metering or pressure regulating fluids at various temperatures is provided for a fuel system as may be utilized in an aircraft gas turbine engine. The valve includes a ceramic or carbon pad which cooperates with a window in a valve plate to provide a variable area orifice which remains operational during large and sometimes rapid variations in temperature incurred from the use of different fuels.

Official Gazette of the U.S. Patent and Trademark Office

*Fuel Systems; Gas Turbine Engines; Valves*

**20080012225** California Inst. of Tech., Pasadena, CA USA

**Aseptic fluid transfer system**

Berkman, Richard M., Inventor; Arnett, James C., Inventor; Cleland, Edward L., Inventor; May 10, 1977; 11 pp.; In English

Patent Info.: Filed September 25, 1975; US-PATENT-4,022,256; US-PATENT-APPL-SN-616765; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012225>

A method and means is provided, which permits the transfer of fluids between separate detached containers, in a manner which preserves the sterility of the fluids during and after their transfer.

Official Gazette of the U.S. Patent and Trademark Office

*Fluids; Materials Handling; Antiseptics*

**20080012226** Rockwell International Corp., El Segundo, CA USA

**High pressure, high temperature transducer**

Vrolyk, John J., Inventor; May 3, 1977; 6 pp.; In English

Contract(s)/Grant(s): NAS8-27980

Patent Info.: Filed February 23, 1976; US-PATENT-4,020,696; US-PATENT-APPL-SN-660540; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012226>

The pressure measurement system utilizes two bourdon tubes with an active side connected to a test specimen and a reference side connected to an outside source. The tubes are attached to a single extensometer measuring relative displacement. The active side deflects when gases vent a specimen failure. The reference side is independently pressurized to a test pressure and provides a zero reference while providing a pressure calibration reference for the active side. The deflection noted by the active side at specimen failure is duplicated on the reference side by venting until an appropriate magnitude of pressure versus deflection is determined. In this way the pressure which existed inside the specimen prior to failure can be determined.

Official Gazette of the U.S. Patent and Trademark Office

*Bourdon Tubes; High Pressure; High Temperature; Pressure Measurement; Pressure Sensors; Temperature Measurement*

**20080012263** Garrett Corp., Los Angeles, CA USA

**Adsorption air conditioner**

Rousseau, Jean L. I., Inventor; December 4, 1979; 12 pp.; In English

Contract(s)/Grant(s): NAS8-30758

Patent Info.: Filed February 17, 1978; US-PATENT-4,176,523; US-PATENT-APPL-SN-879014; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012263>

A solar powered air conditioner using the adsorption process is constructed with its components in a nested cylindrical array for compactness and ease of operation.

Official Gazette of the U.S. Patent and Trademark Office

*Adsorption; Air Conditioning Equipment; Cylindrical Bodies; Void Ratio*

**20080012274** Acurex Corp., Mountain View, CA USA

**Liquid cooled helmet**

Elkins, William, Inventor; Williams, Bill A., Inventor; February 13, 1979; 5 pp.; In English

Contract(s)/Grant(s): NAS2-6650

Patent Info.: Filed December 13, 1976; US-PATENT-4,138,743; US-PATENT-APPL-SN-749970; No Copyright; Avail.:

CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012274>

Liquid cooled helmet comprising a cap of flexible material adapted to fit the head of a person, cooling panels mounted inside the cap forming passageways for carrying a liquid coolant, the panels being positioned to engage the cranium and neck of a person wearing the helmet, inlet and outlet lines communicating with the passageways, and releasable straps for securing the helmet about the neck of the wearer.

Official Gazette of the U.S. Patent and Trademark Office

*Coolants; Cooling; Helmets; Panels; Passageways*

**20080012296** NASA, Washington, DC USA

**Fluid leak indicator**

Anderson, George E., Inventor; Loo, Shu, Inventor; September 12, 1989; 6 pp.; In English

Patent Info.: Filed May 29, 1985; US-PATENT-4,864,847; US-PATENT-APPL-SN-738931; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012296>

A fluid leak indicator (30) for detecting and indicating leaks in visually inaccessible fluid tubing joints (20, 21), such as those obstructed by insulation (24), includes a bag system (25) and a wicking system (30) surrounding or wrapping the joints (20, 21) under the visual obstructing material (24). Leaking fluid is collected in the bag (25) or on the wicking material (34) where it is conducted along the wicking material (34) to a visibly accessible capturing transparent indicator bulb (35) for

providing a visual indication of the leak without requiring a chemical change in the capturing indicator bulb (35).  
Official Gazette of the U.S. Patent and Trademark Office  
*Detection; Leakage; Fluids*

### 35

## INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

**20080000401** Naval Research Lab., Washington, DC USA

### **Toward Optimizing OTH-System Performance Through the Use of Digital Techniques for Data Handling and Processing**

Hoffmeyer, J A; Utley, F A; Dec 21, 1973; 31 pp.; In English

Report No.(s): AD-A472220; NRL-7638; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472220>

This report describes the need for implementing advanced concepts of OTH- system performance capabilities in a research and development environment prior to the design of an operational OTH radar system. Specifically the improvement of data-handling and digital signal-processing techniques are discussed. The benefits of increasing the digital capabilities of the Madre system include an automated methodology for target-track synthesis, real-time optimum operational frequency utilization, transmission of covert messages to the Quiet Task Force (QTF), improved probability of detection of ships through reduction of resolution cell size, and improved probability of detection of small targets such as antiship missile. The hardware needed to accomplish this system performance is described in detail. Emphasis is placed on the impact of OTH technology on naval application.

DTIC

*Data Processing; Digital Techniques; Over-the-Horizon Radar*

**20080000413** Naval Research Lab., Washington, DC USA

### **Radar Transcriptions from AN/FPS-95 to Madre OTH Radar**

Boyd, Frank E; Howe, Charles M; Apr 1974; 41 pp.; In English

Report No.(s): AD-A472248; NRL-MR-2766; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472248>

Magnetic tape recording of the AN/FPS-95 OTH radar receiver output have been converted on a general purpose computer to a form suitable for playback on the MADRE radar signal processor. These playbacks demonstrate the excellent detection capability of the AN/FPS-95 when used in conjunction with the MADRE processor and displays. The usefulness of clutter filtering, doppler shifting, and data word bit selection are demonstrated.

DTIC

*Over-the-Horizon Radar; Radar Receivers*

**20080000414** Naval Research Lab., Washington, DC USA

### **AN/FPS-112(XN-1) Detailed Test and Evaluation Plan**

McGeogh, James E; Thomasson, Joe F; Skaggs, Glenn A; Rohlf, Derrill C; Feb 1974; 21 pp.; In English

Report No.(s): AD-A472249; NRL-MR-2723; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472249>

A one-year Test and Evaluation (T&E) Plan is presented to identify the technical performance characteristics and operational capabilities of the AN/FPS-112 (XN-1) radar (formerly known as CHECKROTE III) and to demonstrate its usefulness in the naval mission of Fleet air defense.

DTIC

*Evaluation; Over-the-Horizon Radar; System Effectiveness*

**20080000418** Naval Research Lab., Washington, DC USA

**A Madre Evaluation Report 3. Detection and Analysis of AMR Test 6210**

Headrick, J M; Curley, S R; Thorp, M E; Ahearn, J L; Utley, F H; Headrick, W C; Rohlfs, D C; Feb 1, 1962; 17 pp.; In English  
Contract(s)/Grant(s): Proj-RF 001-02-41-4007

Report No.(s): AD-A472254; NRL-MR-1316; NRL-PROB-R02-23; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472254>

Portions of the trajectory of the Vertical Balloon, AMR Test 6210, were monitored with the Madre radar from Chesapeake Bay Annex. Detection was accomplished via direct look. Post flight position data from AMR and the Madre data from the trajectory were combined to confirm the vertical pattern of the Madre antenna. This is an interim report on one phase of the problem; work is continuing on this and other phases.

DTIC

*Balloons; Detection; Flight Tests; Missile Detection; Missile Ranges; Missiles; Radar*

**20080000419** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar, Part 1. Mission of and Siting Information on FPS-95**

Gager, F M; Zettle, E N; Apr 15, 1964; 15 pp.; In English

Report No.(s): AD-A472255; NRL-MR-1527; NRL-PROB-53R02-42; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472255>

The mission of the proposed HF radar is to detect moving targets, under certain operating limitations, in the following modes: (1) Aircraft population counting. (b) Missile launch watching. (c) Tracking of some aircraft of special interest. (d) Atomic events, both ground and air bursts. (e) Operating limitations.

DTIC

*Atoms; Detection; Over-the-Horizon Radar; Radar Tracking; Target Acquisition; Targets*

**20080000420** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 3**

Davis, J R; Gager, F M; Headrick, J M; Zettle, E N; Ahearn, J L; Headrick, W C; Utley, F H; Tesauro, C B; Ward, E W; Jun 18, 1964; 112 pp.; In English

Report No.(s): AD-A472257; NRL-MR-1540-PT-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472257>

NRL Memo Report 1422 of May 1963, was a direct response to a DOD request for information on a MADRE type over-the-horizon radar for prototype installation on foreign soil. A follow-up joint effort by USAF and NRL to arrive at some additional cost information was made on or about 1 November 1963. Further, DOD memo of 7 February 1964 directed mainly to USAF and Navy in substance called for a study phase exercise (so called Phase 1) among qualified commercial concerns on equipment costs and economic trade-offs for a state-of-the-art MADRE-like radar. Navy, as consultant to USAF's Rome Air Development Center, has prepared NRL Memo Report 1537, which is a detailed Work Statement Specification for such an OHD radar. Memo Report 1537 is in detail and should be used as the source for equipment specifications and equipment employment. Although this report addresses itself to a different mission from CONUS protection a station complement suitable for SLEM detection simply involves additional antenna complexity and a redundancy in transmitters, signal processing and data handling to satisfy the SLEM threat. It is unfortunate in the area of costing, that the efforts of the separate Air Force and Navy committees operating under DOD Memo R&E Log No. 64-1502 will not be able to digest the detailed costing of a commercial firm nature which will be one of the direct results of the aforementioned Study Phase. The commercial concern response to Phase 1 has a deadline of 1 September 1964. Subsequently USAF and NRL expect to digest the submitted material and report to DOD their mutual findings with recommendations. In consequence the cost information, hurriedly prepared, presented here is only of a quasi-commercial flavor, but believed to be quite realistic in the totals though discrepancies can be found.

DTIC

*Missiles; Over-the-Horizon Radar; Signal Processing; Surveillance*

**2008000579** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 17. Exposure of Fire Detector Sensor Heads to a High-Level Pulsed HF Field**

Skaggs, G A; Apr 1969; 10 pp.; In English

Contract(s)/Grant(s): MIPR-30-602; MIPR-64-3412

Report No.(s): AD-A472347; NRL-MR-1981; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The sensor heads of a fire detection system were subjected to a high level pulsed RF field in the HF frequency band. They retained their satisfactory operation at exposure levels greater than 2500 volts/meter (peak). This is an interim report on one phase of the problem; work is continuing on this phase and other phases of the problem.

DTIC

*Exposure; Fires; High Frequencies; Over-the-Horizon Radar*

**2008000581** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 7**

Brunelly, Jr , John J; Long, Patrick G; Gager, F M; Sharki, Philip; Oct 6, 1965; 6 pp.; In English

Report No.(s): AD-A472350; NRL-MR-1647; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report contains information on personal conduct of U.S. civilians and military in the host country, Turkey, which was not received in time to be incorporated in NRL Memo Report 1637. The material is important enough to issue as a separate report, though this report is considered additional material for NRL Memo Report 1637. This is an interim report on one phase of the problem; work is continuing. NRL Memo Report 1637 contains information of value to prospective contractors who may find themselves in an installation and check-out phase in eastern Turkey as such activity relates to AN/FPS-95. In addition to the content of the above report which relates to personal conduct and the admonition to avail oneself of advice from the U.S. Turkish Embassy in Ankara, the following information was received from the Embassy in an official-informal manner and deemed important enough to disseminate in report form as additional information for Report 1637 referenced above.

DTIC

*Contractors; Over-the-Horizon Radar; Personnel Management; Public Relations*

**2008000582** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 9. Missile Detection at Altitude**

Headrick, J M; Ward, E W; Lucas, D L; Sep 1966; 64 pp.; In English

Report No.(s): AD-A472351; NRL-MR-1727; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report gives expected OTH radar performance for a site on Cyprus viewing the area around Lake Balkhash. This is an interim report on a phase of the problem; work is continuing.

DTIC

*Missile Detection; Over-the-Horizon Radar*

**2008000598** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 12. Missile Detection at Altitude for a Medium Distance**

Headrick, J M; Ward, E W; Lucas, D L; Feb 1967; 75 pp.; In English

Report No.(s): AD-A472379; NRL-MR-1758; XB-NRL/MR/5300; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It has been suggested that a limited capability hf radar might be accommodated on the existing Turkish site near Diyarbakir and that this radar could furnish useful coverage for missiles in the Lake Balkhash region (1, 2 and 3). The radar location is taken as 38 degrees N 40 degrees E and the target as 46 degrees N 73 degrees E giving a great circle ground range of 1494 naut mi and forward and reverse bearings of 061 degrees and 262 degrees true. ITSA long range ionospheric data have been used with the prediction methods of ESSA Technical Report, IER 1 - NSA 2 and the radar application of such methods as is described in an NRL report (5). The operating period of 1968-1970 with an estimated average sunspot number (SSN) of 110 is examined for three months, June, September and December, being representative of summer, spring/fall and winter respectively. A frequency complement composed of narrow band channels at nominally 9, 10, 11, 12, 13, 14, 16, 18, 20, 22, 24, 27, 30 Mc has been assumed available. Target altitudes considered are 0, 50, 100 and 150 km. The signal absorbing layer has been considered slightly below 100 km. Since the radar installed on the existing site probably will not permit a full ground screen, a launch angle minimum of 4 degrees has been set. This controlling noise was taken as that given in CCIR Report #322 except that noise power was not allowed to drop below a threshold set by a median level,  $N_m = 148 + 12.6 \ln(fmc/3)$ db, below

a watt; this noise is an estimate for the narrow band (5-10 kc) frequency complement assumed.

DTIC

*Missile Detection; Over-the-Horizon Radar*

**2008000634** Duke Univ., Durham, NC USA

**Discrimination, Identification and Tracking of Unresolved Targets Using Tomographic Integration of Multiplex Sensor Data**

Brady, David; Jan 2007; 34 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0335

Report No.(s): AD-A472487; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report describes progress in the 2002-2006 fiscal years in development of a small aperture telescopic array for identification and tracking of flying objects using their visible spectral radiance and position. The goal of this project is to simultaneously track and identify objects in orbit. Here we describe several instruments we have developed based on spectrally dispersive elements rather than interferometric designs. These systems also capture spatial and spectral information from a target point source, but do not exhibit the multiplex disadvantage in SNR. These systems concentrate the signal photons onto one or a few narrow bands on the detector, rather than the RSI, which distributes the signal photons across the entire detector. These dispersive systems are also less sensitive to vibration and precise alignment versus the RSI system.

DTIC

*Detectors; Multiplexing; Projectiles; Targets; Tomography*

**2008000917** Naval Research Lab., Washington, DC USA

**A Proposal for an Operational HF Radar**

Gager, F M; Guthrie, R C; Headrick, J M; Page, I H; Zettle, E N; May 10, 1963; 70 pp.; In English

Report No.(s): AD-A472352; NRL-MR-1422; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to the request of 7 March 1963 from the Director of Defense Research and engineering a radar system is proposed for the primary purpose of surveillance and tracking of aircraft within the USSR and the secondary purpose of detection of missile and ESV launchings. The radar system being proposed is based on the design of the Madre radar and the experience gained with the Madre installation at the NRL Chesapeake Bay Annex. The proposed radar, being required to meet perhaps the most severe demand which could be made of such a high frequency OTH radar, should have somewhat greater sensitivity, clutter rejection capability and frequency range (6 to 30 Mc) than the NRL Madre. It should also have complete flexibility of operating frequency choice and of antenna scan. These characteristics for the operational radar system are dictated by the combined effect of the information requirements desired and the environment within which the radar must perform, including such factors as the following:

DTIC

*Radar; High Frequencies; Antennas*

**2008000989** Library of Congress, Washington, DC USA

**Cruise Missile Defense**

Hickad, Ravi R; Bolcom, Christopher; Aug 27, 2004; 7 pp.; In English

Report No.(s): AD-A472612; CRS-RS21921; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472612>

Congress has expressed interest in cruise missile defense for years. Cruise missiles (CMs) are essentially unmanned attack aircraft -- vehicles composed of an airframe, propulsion system, guidance system, and weapons payload. They may possess highly complex navigation and targeting systems and thus have the capability to sustain low, terrain-hugging flight paths as well as strike with great accuracy. CMs can be launched from numerous platforms -- air-, land-, or sea-based -- and they can be outfitted with either conventional weapons or weapons of mass destruction (WMD). The Department of Defense is pursuing several initiatives that seek to improve capabilities against an unpredictable cruise missile threat. These initiatives compete for funding and congressional attention. This report will be updated as events warrant.

DTIC

*Antimissile Defense; Cruise Missiles; Defense Program; Interoperability; Military Operations; Missile Defense; System Effectiveness*



**20080001157** Woods Hole Oceanographic Inst., MA USA

**Using a Near-Bed Sediment Flux Sensor to Measure Wave Formed Bedform Migrations and Formation Processes**

Traykovski, Peter A; Oct 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-01-1-0564; Proj-13056400

Report No.(s): AD-A472813; No Copyright; Avail.: Defense Technical Information Center (DTIC)

My research program focuses on identifying and quantifying sediment erosion, transport, and deposition processes on the continental shelf through state of the art observational techniques in both fine grained and sandy environments. In sandy environments, my goal is to understand the detailed interactions and feedbacks between hydrodynamics, bedforms, and the resulting sand transport. In fine-grained environments, I have been investigating the role fluid mud flows as a depositional mechanism in areas with high deposition rates. In both of these types of environments, I have also focused on relating the small-scale transport processes to larger temporal and spatial scale depositional and erosional patterns.

DTIC

*Ocean Bottom; Ocean Surface; Sediment Transport; Sediments; Soil Mechanics; Soils; Water Waves*

**20080001192** Purdue Univ., West Lafayette, IN USA

**Conjugate Gradient Based Reduced-Rank Signal Processing for Military Digital Communications**

Zoltowski, Michael D; May 1, 2007; 19 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0149

Report No.(s): AD-A472926; PU-TR-ECE-15-2007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The project met the objectives of developing and transitioning fundamental advances in reduced-rank adaptive signal processing. The methods have been applied to space-time equalization and interference cancellation with application to high-speed, MIMO wireless military digital communications. There was an emphasis on exploitation of second-order spatial statistics of the channel and temporal statistics of the interference to design transceivers for multi-antenna wireless communication systems. Based on space-time spreading, we showed that if signals are transmitted along the strongest eigen-direction of the channel and the weakest eigen-direction of the interference, the average SINR is maximized. We also derive optimally power loaded space-time beam-forming (STBF) schemes and show that if strong channels coincide with weak interference, then error probability reduces considerably. In order to increase transmission rates, we combined Space-Time Block Coding STBC with Space-Time Beamforming (STBF) and developed power loading schemes and low-complexity receivers. Our analytical and simulated results corroborate that STBF with optimal power loading considerably reduces error probability and channel estimator errors.

DTIC

*Conjugate Gradient Method; Prediction Analysis Techniques; Pulse Communication; Signal Processing; Telecommunication*

**20080001193** Defence Research and Development Canada, Toronto, Ontario Canada

**Development of an Operator-Machine Interface for ELVISS**

McFadden, Sharon M; Crebolder, Jacquelyn M; Larochelle, Vincent; Mar 2006; 61 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472928; DRDC-TR-2006-057; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DRDC Valcartier has developed a multi-sensor surveillance system composed of an active imaging system (the Airborne Laser-Based Enhanced Detection and Observation System (ALBEDOS)) and a thermal Infrared (IR) imaging system. This system is called the Enhanced Low-light level Visible and Infrared Surveillance System (ELVISS). The purpose of the system is to enhance surveillance capability at night and under degraded weather conditions especially for Search and Rescue (SAR) operations. Throughout the development process, DRDC Toronto was responsible for the design of the Operator-Machine Interface (OMI) for ELVISS. This report summarizes the development of the OMI carried out under Work Unit 13da22, Operator Machine Interface (OMI) for ELVISS. The emphasis is on ELVISS' current state and includes recommendations for research and development that would further enhance the ability of the system to support SAR operations.

DTIC

*Infrared Radiation; Surveillance*

**20080001240** Defence Research and Development Canada, Toronto, Ontario Canada

**A Signal Detection Model of Compound Decision Tasks**

Duncan, Matthew; Dec 2006; 56 pp.; In English

Report No.(s): AD-A473015; DRDC-TR-2006-258; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Detection and identification represent two fundamental types of decision tasks. Although research has focused on each

in isolation, the pure forms of these tasks are generally not representative of more complex naturalistic decision environments. For example, a decision maker involved in a Search and Rescue (SAR) operation is faced with locating and identifying a crash site. This kind of decision environment is characterized by both detection and identification components. That is, the decision maker is confronted with uncertainty regarding the presence of a target crash site, and the task of identifying the target from among similar looking structures in the terrain. Decision research using compound decision tasks (detection plus identification) has the advantage of making greater contact with naturalistic environments, but carries with it the cost of increased complexity in analyzing and understanding the data. Because compound decision tasks have more than one locus where decision making can be affected, a formal method is needed to disambiguate (deconfound) effects on decision making and simplify an understanding of decision making performance in complex tasks. In this report a formal model of compound decision tasks (SDT-CD) is presented which fulfills this role. The model was assessed by an analysis of several demonstration data sets from a wide variety of content domains which highlight its ability to simplify the complexity of the task and provide readily interpretable results. In addition to measures of performance and decision bias, the model can be used to test hypotheses about decision making and permits an assessment of whether decision making is optimal.

DTIC

*Decision Making; Detection; Signal Detection; Signal Processing*

**20080001266** Inter-American Univ. of Puerto Rico, Bayamon, Puerto Rico

**Aspect Angle Dependence of Pump-Induced Turbulence in the Ionosphere (Short-Term Support)**

Isham, Brett C; Feb 28, 2007; 4 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0308

Report No.(s): AD-A473060; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During Fall 2005 and Fall 2006 experiments were carried out at EISCAT in Norway aimed at advancing related science questions while improving the technical capabilities of ground-based radar and radio remote sensing systems. Significant progress was made between these campaigns in technical equipment capabilities and groundwork was laid for future advances. Related collaborations were initiated in advance of the 2006 campaign to assist in 2006 and future experiments. Radio and computer equipment was purchased for use during the 2006 campaign and beyond. Wideband plasma line channels and remote observations in Sweden and Finland were implemented on the EISCAT Tromssa radar, and an additional radio instrument was fielded in the 2006 campaign. Results were presented by the PI at two international meetings (one invited). The grant helped maintain momentum in the hiring of a new research faculty member and it is expected that there will be a new hire in August 2007. Four students are currently involved in work related to the project.

DTIC

*Radar Tracking; Radio Receivers; Radio Transmission; Turbulence*

**20080001405** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar. Part 6**

Brunelly, Jr, John J; Gager, F M; Long, Patrick G; Sharki, Philip; Aug 13, 1965; 38 pp.; In English

Report No.(s): AD-A472246; NRL-MR-1637-PT-6; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472246>

No abstract available

*Over-the-Horizon Radar; Radar Equipment*

**20080001442** Naval Research Lab., Washington, DC USA

**Information on Over-the-Horizon Radar, Part 4**

Howe, C M; Rogerson, M E; Tesauro, C B; Zettle, E N; Sep 15, 1964; 30 pp.; In English

Report No.(s): AD-A472256; NRL-MR-1567; NRL-PROB-53R02-42; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472256>

The use of a receive only site in conjunction with an active over-the-horizon radar to obtain additional coverage at low cost is considered. An FLR-9 receiving array or an FRD-10 receiving array in conjunction with an FPS-95 radar is discussed. This is an interim report on one phase of the problem; work is continuing.

DTIC

*Over-the-Horizon Radar; Multistatic Radar; Launching Sites*

**20080001494** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Description and Field Evaluation of the Broad-Band Underwater Recording Buoy System**

Trevorrow, Mark V; Vagle, Svein; Hall-Patch, Nick; Dec 2005; 46 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A472936; DRDC-TM-2005-231; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents the design and features of a new four-element broad-band underwater recording buoy system. These buoys named the Broad-band Underwater Recording Buoys (BURBs) were built to facilitate medium-frequency underwater acoustic transmission experiments and for measurement of moving vessel acoustic signatures. Each BURB supports two wide-band hydrophones digitized with 16-bit resolution at 40,000 samples per second each and recorded onto internal hard-drive. Each BURB records its differential GPS position at 1 s intervals. Total operational duration is in excess of 36 hours of continuous operation. In an alternate configuration each BURB can acquire four-channel data from a new 3-axis acoustic intensity sensor. This report presents details on the BURB design construction acoustic calibration and operation. Example results from acceptance sea-trials conducted in March and April 2005 are presented.

DTIC

*Broadband; Buoys*

**20080001530** ORSA Corp., Aberdeen, MD USA

**A Study of Sub-MMW Systems and Component Requirements**

Wallace, H B; Rosker, Mark; May 1, 2005; 30 pp.; In English

Report No.(s): AD-A471347; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Equipment Specifications; Radar*

**20080001666** Air Force Research Lab., Hanscom AFB, MA USA

**Geospace Plasma Dynamics: Final Report (2002-2007)**

Basu, Bamandas; Jasperse, John R; Aug 14, 2007; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2311

Report No.(s): AD-A473140; AFRL-VS-HA-TR-2007-1074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473140>

Radar measurements of backscatter from plumes extending above the bottom side spread-F layer correlated well with observations of equatorial plasma bubbles in quiet conditions with lower correlation between scintillation and observations of plasma bubbles. DMSP satellites and the ROCSAT-1 satellite showed significantly fewer occurrences of plasma bubbles than expected near the west coast of South America and an east-west chain of GPS receivers confirms a steep longitudinal gradient in EPB occurrence rate. A statistical database of equatorial plasma bubbles has been compiled. Observations of transient sheets of field-aligned currents observed by DMSP during the main phase magnetic superstorm showed that under some highly stressed conditions contributions from low energy electrons and precipitating ions contribute significantly to Pedersen conductances. We developed a new fluid theory for the auroral return-current region in the guiding-center and gyrotopic approximation and used in calculations of the turbulent beating rate for magnetospheric ions in downward Birkeland Current regions. We compared different theoretical descriptions of linear equatorial plasma instabilities, and showed that the ballooning mode description gives a physically more accurate and complete description and thus should be adopted for calculating linear growth rates. Our study of the unstable Rayleigh-Taylor plasma modes in the equatorial ionosphere has shown that the magnetic field fluctuations are associated with the shear Alfvén waves, and that the electrostatic assumption is usually justified. Assimilating the vertical drift of the plasma after sunset can improve forecasts of equatorial radio scintillation.

DTIC

*Magnetohydrodynamic Stability; Plasma Bubbles; Plasmas (Physics); Scintillation*

**20080001667** Institute of Physical and Chemical Research, Sendai, Japan

**Homeland Security Enforcement Using Novel Terahertz Technology II**

Dobroiu, Adrian; May 12, 2007; 4 pp.; In English

Contract(s)/Grant(s): FA5209-06-P-0140

Report No.(s): AD-A473141; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473141>

The work focused on (1) improving detection limit using terahertz (THz) inspection method for higher sensitivity by

developing better sources, detectors, and optical design, (2) testing powder detection for moving objects, (3) detecting effects of wave diffraction on envelope edges, and (4) evaluation of the terahertz wave penetration depth in metals and other materials.  
DTIC

*Detection; Electromagnetic Radiation; Imaging Techniques; Security*

**20080001852** Naval Postgraduate School, Monterey, CA USA

**Track Score Processing of Multiple Dissimilar Sensors**

Patsikas, Dimitrios; Jun 2007; 79 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473278; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this thesis, a data fusion problem when a number of different types of sensors are deployed in the vicinity of a ballistic missile launch is studied. An objective of this thesis is to calculate a scoring function for each sensor track, and the track file with the best (optimum) track score can then be used for guiding an interceptor to the threat within the boost phase. Seven active groundbased radars, two space-based passive infrared sensors and two active light detection and ranging (LIDAR) sensors are used to track the ballistic missile in the boost phase. Each space-based platform carries one passive infrared sensor and one LIDAR. For the threat scenario, an IMPULSE intercontinental ballistic missile model is used to create the trajectory of a generic ballistic threat. The IMPULSE model is developed by the National Air and Space Intelligence Center to provide an accurate representation of ballistic missiles. Each sensor provides a track of the missile in the boost phase by using a multiple hypotheses tracking algorithm with an extended Kalman filter. The calculation of the track scoring function is to identify the sensor with the best track file. A track score is calculated for each sensor based on the kinematics of the missile flight parameters and the signal-to-noise ratio at the sensor. By using likelihood ratios, the optimum track file of the threat can then be determined and the corresponding track file can be transmitted to the battle manager control in order to lead the interceptor vehicle against the threat using the track file with the best score. Using the optimum track file scoring signal processing techniques developed in this thesis, the best track file can be sent to the interceptor to destroy the ballistic threat. This leads to a faster response management where the threat can be destroyed inside the territory of the country which launched the threat before any countermeasures are deployed.

DTIC

*Antimissile Defense; Ballistic Missiles; Infrared Detectors; Scoring*

**20080001856** Naval Academy, Annapolis, MD USA

**Autonomous Detection and Imaging of Abandoned Luggage in Real World Environments**

Papon, Jeremie A; May 3, 2007; 82 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473285; USNA-TSPR-357; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Trident Project developed a system that is able to detect and produce high resolution imagery of unattended items in a crowded scene, such as an airport, using live video processing techniques. Video surveillance is commonplace in today's public areas, but as the number of cameras increases, so do the human resources required to monitor them. Additionally, current surveillance networks are restricted by the low resolution of their cameras. For example, while there is an extensive security camera network in the London Underground, its low resolution prevented it from being used to automatically identify the terrorists that entered the train stations in July 2005. With this in mind, this project developed a surveillance system that is able to autonomously monitor a scene for suspicious events by combining a low resolution camera for surveillance (a webcam) with a moving high resolution camera (a 6 mega-pixel digital still-frame camera) to provide a greater level of detail. This enhanced capability is used to determine whether or not the event is a threat. For the purposes of this research, suspicious events were defined as a person leaving a piece of luggage unattended for an extended period of time. Initial analysis of the surveillance video involved separating the foreground (such as people carrying luggage) from the background. In order to do this using live video, an automated algorithm was developed which creates a composite background image from a small number of video frames. In the algorithm, areas detected as motion were removed from individual frames.

DTIC

*Autonomy; Imaging Techniques; Security; Surveillance*

**20080002168** National Defense Univ., Washington, DC USA

**Deploying Nuclear Detection Systems: A Proposed Strategy for Combating Nuclear Terrorism**

Goodby, James; Coffey, Timothy; Loeb, Cheryl; Jul 2007; 29 pp.; In English

Report No.(s): AD-A473225; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473225>

The most likely means of delivering a nuclear bomb on a major city is through a successful smuggling effort by a terrorist

organization. The catastrophic damage it would cause demands cooperative action by all responsible governments. Several U.S. Government programs are in place to deal with this threat. These programs focus on the following: (1) Measures to prevent access by terrorist groups to fissile material, particularly enriched uranium and plutonium, the basic fuel for nuclear bombs; (2) Measures to strengthen international institutions to enable governments to deal more effectively with illicit trade in fissile materials and in equipment that can produce such materials; (3) Measures to enhance international cooperation in intelligence sharing and law enforcement; (4) Cooperative international defense activities designed to intercept illegal trafficking in fissile materials and equipment to produce these materials; and (5) Strengthening the capacity to monitor and detect illicit shipments of fissionable materials at entry points into the USA and, in cooperation with other countries, at key transportation nodes overseas. This report focuses on the last of these programs, and primarily on deployment of sensors overseas. This report provides an overview of the threat from nuclear terrorism; discusses the role of intelligence and risk assessments in countering this threat; provides a brief overview of nuclear detection technologies and issues; briefly summarizes key U.S. Government programs involved in nuclear detection; summarizes domestic legislation, which provides the impetus for increasing international collaboration; and discusses the need for a global approach to nuclear nonproliferation in which international institutions assume a leading and sustained leadership role.

DTIC

*Deployment; Detection; Fissionable Materials; Nuclear Weapons; Terrorism; United States*

**20080002395** Toronto Univ., Ontario Canada

**Development of Highly Ordered Heterostructured Semiconductor Nanowire Arrays for Sub-Wavelength Optical Devices**

Ruda, Harry; Nair, Selvakumar; Jun 2007; 31 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0435

Report No.(s): AD-A473573; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473573>

Methodology for efficient growth of semiconductor nanowires of several II-VI (ZnSe, ZnO, ZnS) and III-VI (GaAs, InSb) nanowires was developed and optimized. Based on optical and transport characterization measurements, defect states responsible for quenching of band-edge luminescence were identified and post-growth treatments were devised to eliminate those defects and to achieve strong excitonic emission. Carrier trapping dynamics was elucidated by ultrafast time-resolved optical pump-probe measurements. Optimized ZnSe nanowires were shown to exhibit an exceptionally high photoconductive response of 22A/W in a single nanowire transistor device. Manganese doped ZnO nanowires were fabricated and above room temperature ferromagnetism was achieved. Transport measurements showed these wires to be n-type with a degenerate carrier distribution. The experimental efforts were supplemented by modeling that included design of high Q-factor nanowire array photonic cavities using as well as a theory of excitons in nanowires.

DTIC

*Excitons; Ferromagnetism; Nanowires; Optical Equipment; Photoconductivity; Photometers; Semiconductors (Materials)*

**20080002404** Florida Univ., Gainesville, FL USA

**Fueling and Stabilizing a Biomolecular Motor-Powered Biosensor for Remote Detection Scenarios**

Hess, Henry; Oct 2007; 24 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0366

Report No.(s): AD-A473585; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473585>

Autonomous micro- and nanodevices, such as 'smart dust', operate in environments with variable temperatures. The activity of integrated biological components, such as enzymes, typically exhibits a pronounced dependence on temperature. Here, strategies to minimize the influence of temperature on device performance are discussed. The temperature dependence of the Michaelis-Menten parameters  $v_{max}$  and  $K_m$  is measured for kinesin motor proteins, and it is concluded that for molecular shuttles powered by kinesin motors a range of subsaturating substrate concentrations exists at which the increase of maximal activity of the kinesin motor with increasing temperature is almost cancelled by a decreasing affinity to its substrate. This example illustrates that temperature stabilization and high activation are competing goals.

DTIC

*Bioinstrumentation; Detection; Quantum Dots; Refueling; Remote Sensing; Stabilization*

**20080002412** Naval Postgraduate School, Monterey, CA USA

**Triggered Infrared Emitter Displays for Individual Identify Friend-or-Foe (IIFF) and Vehicular Mounted Identify Friend-or-Foe (VMIFF) Devices**

Williams, Patrick S; Jun 2007; 93 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473604; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473604>

Individual IFF devices, based on polymer emitters on flexible substrates, have been evaluated to determine range of activation and observation, performance under extreme environmental conditions, and emitter intensity decay as a function of multiple activations and time. Key results include observation at distances in excess of 700 meters and device functionality in a temperature range from -40 degrees C to 71 degrees C. From data obtained in the development and testing of the individual anti-fratricide devices, a vehicle version is developed with the purpose of mitigating air-to-ground fratricide. A rudimentary prototype is developed and tested, followed by an improved, more powerful version. Field tests include establishing limits for activation and observability. Finally, the emission is captured and graphically represented as a function of time. Key results include observation at distances in excess of 9.5 km and demonstration of remote activation. An area for further research using quantum dots down conversion is offered. Quantum dots down conversion could be used for wavelength tuning of the polymer organic light emitting material.

DTIC

*Display Devices; Emitters; IFF Systems (Identification); Infrared Radiation; Night Vision*

**20080002583** Adelaide Univ., Australia

**MIMO Coded Radar Waveform Design for Optimal Tracking**

White, Langford B; Ray, Pinaki S; Jun 14, 2005; 37 pp.; In English

Contract(s)/Grant(s): FA520-90-4-P0418

Report No.(s): AD-A473743; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A conceptual framework for the design of transmit signals for MIMO radar systems as developed for communication signals has been formulated. This was achieved by constructing a generalized matched filter in analogy of the usual case. The corresponding maximum likelihood receiver was studied in detail and shown this to be optimal in accordance with the Cramer-Rao lower-bound criterion. Mathematics for defining and generating coding coefficients was developed. Tracking of a single target has been treated within this framework in terms of state equations. A tracker defined by Kalman predictor has been introduced. A channel/target model involving both linear and nonlinear dynamics has been studied.

DTIC

*Coding; MIMO (Control Systems); Telecommunication; Waveforms*

**20080002808** Altarum Inst., Ann Arbor, MI USA

**RADAR Imaging Transformation for Heads Up Display Utility**

Wilson, Brian; Subotic, Nikola; Sep 2007; 27 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-6635; Proj-7184

Report No.(s): AD-A473815; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The following report discusses the display and sensor requirements for a heads up display (HUD) capable of presenting a 3-Dimensional (3-D) scene to a pilot during instrument landing that provides data indicative of barriers and obscurations in the flight path and intended landing area. The necessary equations for relating common electro-optic sensor parameters to the equivalent RADAR parameterization are provided such that a cross-sensor analysis can be performed to determine the appropriate sensor data transformations for display. Formulations of the appropriate data transformations are made such that RADAR data can be displayed appropriately such that a human looking through a HUD can easily interpret the RADAR data to provide a 3-D view of the intended landing area.

DTIC

*Display Devices; Imaging Techniques; Radar Imagery*

**20080002890** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Infrared Camera Characterization of Bi-Propellant Reaction Control Engines during Auxiliary Propulsion Systems Tests at NASA's White Sands Test Facility in Las Cruces, New Mexico**

Holleman, Elizabeth; Sharp, David; Sheller, Richard; Styron, Jason; October 15, 2007; 13 pp.; In English; Infrared Thermographers Conference, 15-19 Oct. 2007, Las Vegas, NV, USA; Original contains black and white illustrations

Report No.(s): ITC 121A-2007-05-24; Copyright; Avail.: CASI: **A03**, Hardcopy

This paper describes the application of a FUR Systems A40M infrared (IR) digital camera for thermal monitoring of a

Liquid Oxygen (LOX) and Ethanol bi-propellant Reaction Control Engine (RCE) during Auxiliary Propulsion System (APS) testing at the National Aeronautics & Space Administration's (NASA) White Sands Test Facility (WSTF) near Las Cruces, New Mexico. Typically, NASA has relied mostly on the use of ThermoCouples (TC) for this type of thermal monitoring due to the variability of constraints required to accurately map rapidly changing temperatures from ambient to glowing hot chamber material. Obtaining accurate real-time temperatures in the JR spectrum is made even more elusive by the changing emissivity of the chamber material as it begins to glow. The parameters evaluated prior to APS testing included: (1) remote operation of the A40M camera using fiber optic Firewire signal sender and receiver units; (2) operation of the camera inside a Pelco explosion proof enclosure with a germanium window; (3) remote analog signal display for real-time monitoring; (4) remote digital data acquisition of the A40M's sensor information using FUR's ThermoCAM Researcher Pro 2.8 software; and (5) overall reliability of the system. An initial characterization report was prepared after the A40M characterization tests at Marshall Space Flight Center (MSFC) to document controlled heat source comparisons to calibrated TCs. Summary IR digital data recorded from WSTF's APS testing is included within this document along with findings, lessons learned, and recommendations for further usage as a monitoring tool for the development of rocket engines.

Author

*Digital Cameras; Auxiliary Propulsion; Digital Data; Propulsion System Configurations; Heat Sources; Infrared Radiation; Liquid Oxygen; Data Acquisition*

**20080012220** Radio Corp. of America, New York, NY USA

**Holographic recording medium**

Gange, Robert Allen, Inventor; March 15, 1977; 5 pp.; In English

Patent Info.: Filed October 16, 1974; US-PATENT-4,012,253; US-PATENT-APPL-SN-515369; No Copyright; Avail.:

CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012220>

A holographic recording medium comprising a conductive substrate, a photoconductive layer and an electrically alterable layer of a linear, low molecular weight hydrocarbon polymer has improved fatigue resistance. An acrylic barrier layer can be interposed between the photoconductive and electrically alterable layers.

Official Gazette of the U.S. Patent and Trademark Office

*Holography; Hydrocarbons; Low Molecular Weights; Photoconductivity*

**20080012258** California Inst. of Tech., Pasadena, CA USA

**Medical tomograph system using ultrasonic transmission**

Heyser, Richard C., Inventor; Nathan, Robert, Inventor; April 11, 1978; 10 pp.; In English

Patent Info.: Filed April 23, 1976; US-PATENT-4,083,232; US-PATENT-APPL-SN-679732; No Copyright; Avail.:

CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012258>

Ultrasonic energy transmission in rectilinear array scanning patterns of soft tissue provides projection density values of the tissue which are recorded as a function of scanning position and angular relationship,  $\theta$ , of the subject with a fixed coordinate system. A plurality of rectilinear scan arrays in the same plane for different angular relationships  $\theta_1, \dots, \theta_n$  thus recorded are superimposed. The superimposition of intensity values thus yields a tomographic image of an internal section of the tissue in the scanning plane.

Official Gazette of the U.S. Patent and Trademark Office

*Energy Transfer; Scanning; Tomography*

**20080012267**

**Super-resolution imaging system**

Jain, Atul, Inventor; August 14, 1979; 11 pp.; In English

Patent Info.: Filed October 13, 1976; US-PATENT-4,164,788; US-PATENT-APPL-SN-731986; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012267>

The resolution of an imaging system is greatly enhanced by radiating an object with a plane wave field from a coherent source variable in either frequency, angle or distance from the object, detecting the wave field transmitted through, or reflected from, the object at some point on the image of the object, with or without heterodyne detection, and with or without a lens system. The heterodyne detected output of the detector is processed to obtain the Fourier transform as a function of the variable

for a direct measurement of the amplitude and surface height structure of the object within a resolution cell centered at the corresponding point on the object. In the case of no heterodyne detection, only intensity data is obtained for a Fourier spectrum.

Official Gazette of the U.S. Patent and Trademark Office

*Coherent Radiation; Detection; Frequencies; Imaging Techniques; Plane Waves; Radiation Sources*

**20080012291** Xenos Medical Systems, Houston, TX USA

**High speed multiwire photon camera**

Lacy, Jeffrey L., Inventor; September 26, 1989; 16 pp.; In English

Contract(s)/Grant(s): NAS9-15767

Patent Info.: Filed August 27, 1985; US-PATENT-4,870,282; US-PATENT-APPL-SN-770113; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012291>

An improved multiwire proportional counter camera having particular utility in the field of clinical nuclear medicine imaging. The detector utilizes direct coupled, low impedance, high speed delay lines, the segments of which are capacitor-inductor networks. A pile-up rejection test is provided to reject confused events otherwise caused by multiple ionization events occurring during the readout window.

Official Gazette of the U.S. Patent and Trademark Office

*High Speed Cameras; Imaging Techniques; Nuclear Medicine; Photons*

**36**

**LASERS AND MASERS**

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 *Solid-State Physics*.

**20080000405** Johns Hopkins Univ., Baltimore, MD USA

**Measurements of Intensity Scintillations and Probability Density Functions of Retroreflected Broadband 980-nm Laser Light in Atmospheric Turbulence**

Davidson, Frederic M; Bucaille, Stephane; Gilbreath, G C; Oh, Eun; Nov 2004; 8 pp.; In English

Report No.(s): AD-A472236; NRL RN-04-1221.1-1057; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472236>

Intensity scintillation variances and intensity probability density functions (PDFs) were experimentally measured for broadband (2 nm), 980-nm laser light reflected by two or more corner cube retroreflectors as a function of retroreflector lateral spacing over a short (75 m) atmospheric optical path. The PDFs transitioned from broad doublepeaked beta-shaped densities to lognormal as the retroreflector spacing was increased to exceed the optical field's lateral coherence length. Specific spacing for a given average atmospheric structural C<sub>2n</sub> eliminated interference between the light beams returned by the retroreflectors. DTIC

*Atmospheric Turbulence; Broadband; Laser Outputs; Lasers; Light Beams; Probability Density Functions; Scintillation*

**20080000430** Air Force Research Lab., Kirkland AFB, NM USA

**Mid-Infrared Optically Pumped, Unstable Resonator Lasers (Postprint)**

Ongstad, A P; Kaspi, R; Dente, G C; Tilton, M L; Chavez, J; Jun 19, 2007; 5 pp.; In English

Contract(s)/Grant(s): DF297213; Proj-4866

Report No.(s): AD-A472280; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472280>

The authors describe high-brightness, broad area midinfrared semiconductor lasers. These devices were fabricated in the authors laboratory using a commercial solid-source molecular beam epitaxial system. The laser structures incorporated 14 type-II quantum wells embedded in thick waveguide/ absorber regions composed of In<sub>0.2</sub>Ga<sub>0.8</sub>As<sub>0.18</sub>Sb<sub>0.82</sub>. The optically pumped devices achieved higher brightness operation as unstable resonators. Each unstable resonator was realized by polishing a diverging cylindrical mirror at one of the facets. For an unstable resonator semiconductor laser operating at 4.6 m, near 84 K, and at a peak power of 6.7 W, the device was observed to be nearly diffraction limited at 25 times threshold.



In comparison, a standard Fabry-P rot laser was observed to be many times diffraction limited when operated under similar conditions.

DTIC

*Infrared Radiation; Lasers; Optical Pumping; Resonators; Semiconductor Lasers*

**2008000431** Air Force Research Lab., Kirkland AFB, NM USA

**Mid-Infrared Optically Pumped, Unstable Resonator Lasers (Preprint)**

Ongstad, A P; May 31, 2007; 13 pp.; In English

Contract(s)/Grant(s): DF297213; Proj-4866

Report No.(s): AD-A472281; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472281>

The authors describe high-brightness, broad area midinfrared semiconductor lasers. These devices were fabricated in the authors laboratory using a commercial solid-source molecular beam epitaxial system. The laser structures incorporated 14 type-II quantum wells embedded in thick waveguide/ absorber regions composed of In<sub>0.2</sub>Ga<sub>0.8</sub>As<sub>0.18</sub>Sb<sub>0.82</sub>. The optically pumped devices achieved higher brightness operation as unstable resonators. Each unstable resonator was realized by polishing a diverging cylindrical mirror at one of the facets. For an unstable resonator semiconductor laser operating at H 4.6 m, near 84 K, and at a peak power of 6.7 W, the device was observed to be nearly diffraction limited at 25 times threshold. In comparison, a standard Fabry-P rot laser was observed to be many times diffraction limited when operated under similar conditions.

DTIC

*Infrared Radiation; Lasers; Optical Pumping; Resonators; Semiconductor Lasers*

**2008000550** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Bipolar Cascade Vertical-Cavity Surface-Emitting Lasers for RF Photonic Link Applications**

Siskaninetz, William J; Sep 2007; 154 pp.; In English

Report No.(s): AD-A472304; AFIT/DS/ENG/07-22; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The development and demonstration of bipolar cascade vertical cavity surface emitting lasers is presented. The systematic approach to designing, fabricating, and characterizing the critical tunnel junction, incorporating the tunnel junction into an edge emitting bipolar cascade laser, and finally the transition to a VCSEL structure is detailed. A novel approach prior to growing and characterizing BC VCSELs was to investigate bipolar cascade light emitting diodes which incorporate the microcavity designs and disentangles the VCSEL cavity effects from the microcavity. The best performing p-doped oxide aperture microcavity design was then used as the microcavity for 1-, 2-, and 3-stage BC VCSELs. The high-frequency modulation characteristics of GaAs-based BC VCSELs operating at 980 nm with GaAs tunnel junctions and p-doped Al(0.98)Ga(0.02)As oxide apertures have been measured and analyzed. Measured -3 dB laser output modulations of 4.5 GHz for 2-stage and 7.1 GHz for 3-stage devices in response to small-signal current injection at an operating temperature of -50 deg C are reported and discussed.

DTIC

*Bipolarity; Cavities; Electro-Optics; Laser Cavities; Lasers; Radio Frequencies; Semiconductor Lasers; Surface Emitting Lasers; Tunnel Junctions*

**2008000575** Dayton Univ. Research Inst., OH USA

**Room-Temperature, Near IR Fluorescence of High Optical Quality KTP (Postprint)**

Hegde, S M; Schepler, K L; Peterson, R D; Zelmon, D E; Apr 2007; 10 pp.; In English

Contract(s)/Grant(s): F33615-00-C-5422; FA8650-06-D-5401; Proj-2003

Report No.(s): AD-A472338; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We investigated room temperature fluorescence in the 500-900nm spectral region from high optical quality, polished and uncoated KTP crystals from three different commercial vendors. The crystals were all cut into 5x5x5 mm<sup>3</sup> cubes with their dielectric axes along the cube edges. The pump source was a tripled Nd:YAG laser operating at 355nm and 7mJ energy having 3ns pulse width and 100Hz pulse repetition rate. Samples from two vendors showed low fluorescence of similar magnitude while samples from the third vendor showed nearly two orders of magnitude higher value in the peak fluorescence near 800nm. In addition, all samples showed a weaker secondary fluorescence band peaking near 600nm. A low fluorescence sample from one of the vendors also showed typical 'gray tracking' at these pump radiation conditions. We have also measured lifetimes of 2.9 +/- 0.7 us and 4.9 +/- 0.1 us for the centers responsible for fluorescence near 845nm and 595nm respectively

in the KTP sample showing highest fluorescence and 'gray tracking' in this group of samples. The manufacturing processes used to produce high optical quality and low fluorescence KTP materials are proprietary to the commercial vendors and were not provided. Possible sources of fluorescence in these materials are discussed.

DTIC

*Bandpass Filters; Crystals; Fluorescence; Near Infrared Radiation*

**2008000632** California Inst. of Tech., Pasadena, CA USA

**Semiconductor Based Transverse Bragg Resonance (TBR) Optical Amplifiers and Lasers**

Yariv, Amnon; Feb 14, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0463; Proj-P471/14

Report No.(s): AD-A472485; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have fabricated electrically pumped, semiconductor TBR lasers in the InP/InGaAsP material system to demonstrate the efficiency gains possible by the incorporation of a transverse Bragg grating. By incorporating a transverse Bragg grating into a large-area laser, the optical modes of the laser can be designed to improve the efficiency compared to traditional index-guided lasers. The resulting transverse Bragg resonance (TBR) waveguide can be designed to have a single lateral mode that is distributed throughout the entire width of the laser for efficient, stable, single lateral mode operation even at high powers. In addition, by designing the dispersion of the TBR modes, we can increase the modal gain at the desired lasing frequencies for further efficiency improvements. We have finished some preliminary measurements of our laser samples and are currently working on optimizing the design for improved performance as well as more detailed measurement and characterization. Our initial findings indicate that the TBR laser may show efficiency gains compared to traditional broad-area lasers. We also have designed, fabricated and characterized two dimensional TBR lasers.

DTIC

*Amplifiers; Bragg Angle; Lasers; Light Amplifiers; Resonance; Semiconductors (Materials)*

**2008000635** Scripps Institution of Oceanography, La Jolla, CA USA

**Simultaneous Measurement of Air-water Interface Slope and the Point Spread Function for the Propagation of Laser Light**

Jaffe, Jules S; Oct 1, 2007; 5 pp.; In English

Contract(s)/Grant(s): N00014-06-1-0374

Report No.(s): AD-A472489; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this project funded by ONR (grant # N00014-06-1-0374) was to measure, understand and be able to predict the propagation of light through the air-sea interface under various sea states. Results indicate that the under sea scattered light patterns are quite simple in mild sea state and wind (< 5 mph) however, the increase in sea state leads to various types of patterns that are currently under analysis.

DTIC

*Air Water Interactions; Laser Outputs; Lasers; Light Beams; Light Scattering; Slopes*

**2008001037** Army Research Lab., Aberdeen Proving Ground, MD USA

**Detection of Energetic Materials and Explosive Residues With Laser-Induced Breakdown Spectroscopy: 2: Stand-off Measurements**

Gottfried, Jennifer L; De Lucia Jr, Frank C; Munson, Chase A; Ford, Christopher; Miziolek, Andrzej W; Sep 2007; 48 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-622618H8049

Report No.(s): AD-A472708; ARL-TR-4241; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472708>

We have developed a double pulse stand-off laser-induced breakdown spectroscopy (LIBS) system capable of detecting explosive residues as far as 50 m. As described in an earlier report (ARL-TR-4240), the use of a double pulse laser improves the sensitivity and selectivity of LIBS for the detection of energetic materials. This report discusses the extension of these studies to stand-off distances. The efficacy of chemometric techniques such as linear correlation, principal components analysis, and partial least squares discriminant analysis for the identification of explosive residues is also discussed. We have shown that despite the typical characterization of LIBS as an elemental technique, the relative elemental intensities in the LIBS

spectra are representative of the stoichiometry of the parent molecules and can be used to discriminate materials containing the same elements.

DTIC

*Explosives; Pulsed Lasers; Residues*

**20080001169** Library of Congress, Washington, DC USA

**Airborne Laser (ABL): Issues for Congress**

Bolkcom, Christopher; Hildreth, Steven A; Oct 22, 2003; 16 pp.; In English

Report No.(s): AD-A472861; CRS-RL32123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA has pursued a variety of missile defense concepts and programs over the past fifty years. Since the 1970s, some attention has focused on directed energy weapons, such as high-powered lasers for missile defense. Today, the Airborne Laser (ABL) program is the furthest advanced of these directed energy weapons and remains the subject of technical and program debate. The Department of Defense (DoD) has been a strong advocate for the ABL and its predecessor programs. The Defense Department and most missile defense advocates argue that the ABL, which is designed to shoot down attacking ballistic missiles within the first few minutes of their launch, is a necessary component of any future U.S. missile defense system. Although some observers have suggested additional roles for the ABL, such as attacking other airborne or even ground targets, the Missile Defense Agency (MDA) maintains it is necessary to concentrate on developing the ABL's primary mission to engage and destroy attacking ballistic missiles before ancillary roles can be considered. Congress has largely supported the Administration's ABL program.

DTIC

*Airborne Lasers; Lasers*

**20080001203** Emory Univ., Atlanta, GA USA

**Characterization of Iodine Quenching and Energy Transfer Rate Constants for Supersonic Flow Visualization Applications**

Heaven, Michael C; Sep 28, 2007; 28 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0369

Report No.(s): AD-A472946; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Planar laser induced fluorescence (PLIF) imaging is being used to study the fluid dynamics of supersonic gas mixing in the nozzle from a chemical oxygen iodine laser (COIL). PLIF images are recorded using laser excitation of the I(sub2) B-X transition. Data for the temperature dependences of the I(sub2)(B) quenching rate constants are needed for the quantitative interpretation of the PLIF data. A Mach 2.6 supersonic nozzle system has been used in an investigation of the quenching of I(sub2)(B) by N(sub2), O(sub2) and He over the temperature range from 120 to 295 K. Quenching by both N(sub2) and O(sub2) exhibited a near linear dependences on temperature for T>150 K. Quenching by He was found to be unimportant under typical COIL operating conditions. The quenching rate constants have been used in a preliminary analysis of PLIF images.

DTIC

*Constants; Energy Transfer; Flow Visualization; Iodine; Reaction Kinetics; Supersonic Flow; Supersonic Nozzles*

**20080001228** New Mexico Univ., Albuquerque, NM USA

**Developing Pulsed Fiber Lasers**

Brueck, Steven; Robin, Craig; Shay, Thomas M; Jun 15, 2007; 40 pp.; In English

Contract(s)/Grant(s): FA9451-05-C-0163

Report No.(s): AD-A472993; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Laser power is at a premium and a diffraction limited optical beam delivers the maximum intensity on target. Therefore, the better the beam quality, the lower the system cost and complexity is reduced considerably by using high quality beams. Single mode optical fiber lasers and amplifiers produce near diffraction limited beams and therefore will result in near diffraction limited optical beams thus they will provide the highest intensities at the lowest laser powers. In the case of pulsed fiber lasers the factors that limit the output power are the fiber nonlinear effects and surface damage on the exit aperture. The nonlinear optical effects include Stimulated Brillouin Scattering (SBS), Stimulated Raman Scattering (SRS), self-phase modulation (SPM) and four-wave mixing (FWM) depending upon the application. For pulse durations of greater than 1-ns SPM and FWM can be neglected. The lowest threshold nonlinear process for long pulse duration is SBS. SBS can be

effectively suppressed. The surface damage on the exit aperture can be eliminated by allowing free expansion in an 'end cap' before the beam exits into free space.

DTIC

*Brillouin Effect; Fiber Lasers; Fiber Optics; High Power Lasers; Laser Beams; Pulsed Lasers*

**20080001497** California Univ., Los Angeles, CA USA

**Adaptive Filtering and System Identification**

Gibson, Steve; Oct 3, 2007; 9 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0234

Report No.(s): AD-A472914; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary objectives of this project are to develop new real time algorithms for adaptive filtering, prediction, and system identification with improved efficiency and numerical stability for the large numbers of channels and high filter orders typically required in Air Force applications such as adaptive optics, laser communications, target tracking and image processing. The research supports research and development at the Air Force Research Laboratory on directed energy weapons and laser communications. The advanced tactical laser (ATL), the airborne laser (ABL) and similar weapons systems are the primary Air Force programs motivating the research. Additional application areas include optical wireless communication systems, blind identification and deconvolution in wireless communications, and active control of noise and vibration. This report discusses recent collaborations with the Air Force Research Laboratory (AFRL) and industry.

DTIC

*Adaptive Filters; Laser Beams; Optical Communication; System Identification; Weapon Systems*

**20080001658** Griffith Univ., Brisbane, Australia

**Laser Cooling with Ultrafast Pulse Trains**

Kielinski, Dave; May 17, 2007; 6 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0045

Report No.(s): AD-A473128; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473128>

The work focused on investigating technology development on a novel laser-cooling technique that uses femtosecond lasers to extend the range of ultracold atomic species. It also made significant advances toward a proof-of-principle laser cooling experiment in the ion trap and in construction of the apparatus for laser cooling of hydrogen. We have published a journal article describing the cooling technique [D. Kielinski, 'Laser cooling of atoms and molecules with ultrafast pulses,' Phys. Rev. A 73, 063407 (2006)].

DTIC

*Cooling; Ions; Laser Cooling; Lasers*

**20080001850** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Mid-IR Transition Metal Lasers (Postprint)**

Schepler, Kenneth L; Jan 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2003

Report No.(s): AD-A473274; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Transition metal ions have been of great interest from the beginning of laser development because of their broadband emission. The first demonstration of a transition metal laser used Ni<sup>2+</sup> as the active ion in 1963. Other transition metal ions such as Co<sup>2+</sup> have also been developed as lasers but low cross sections and the need for cryogenic cooling to achieve high efficiency hindered their transition from discovery to applications. The 1995 innovation of pairing Cr<sup>2+</sup> with a host that has tetrahedral symmetry substitution sites led to demonstration of broadly tunable, room temperature, mid-IR lasers. Progress in advancing this class of transition metal laser to output power of 18 W, tuning range to several hundred nanometers, and modelocked operation down to 100 fsec will be reviewed. Plans for future development in the areas of femtosecond pulse operation, high speed frequency tuning, fiber format, and direct electronic pumping will be discussed.

DTIC

*Infrared Radiation; Lasers; Solid State Lasers; Transition Metals*

**20080001921** Draper (Charles Stark) Lab., Inc., Cambridge, MA USA  
**Report on Laboratory Test of the Aerial Profiling of Terrain System**

Hand, James A; Feb 1983; 91 pp.; In English

Contract(s)/Grant(s): 14-08-0001-14548

Report No.(s): AD-A473375; CSDL-R-1635; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report covers laboratory testing of the Aerial Profiling of Terrain System (APTS) from December, 1981 to completion in January, 1983.

DTIC

*Lasers; Terrain*

**20080001930** Air Force Research Lab., Kirkland AFB, NM USA

**Stimulated Brillouin Scattering (SBS) Suppression Techniques**

Zmuda, Michael W; Jul 31, 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DF406206; Proj-JTO3

Report No.(s): AD-A473393; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In an effort to increase SBS threshold for future high power fiber amplifier applications, several mitigation techniques have been evaluated and modeled. Among these techniques include novel modulation schemes, core material modifications, and utilization of the core thermal differential during amplification. The most promising techniques were combined to provide an estimated increase in SBS threshold by over a decade.

DTIC

*Acoustic Velocity; Brillouin Effect; Fiber Lasers; High Power Lasers*

**20080002345** Air Force Research Lab., Edwards AFB, CA USA

**Ion Velocity Measurements within the Acceleration Channel of a Low Power Hall Thruster (Preprint)**

Hargus, Jr , William A; Nakles, Michael P; Aug 21, 2007; 28 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473491; AFRL-PR-ED-TP-2007-389; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473491>

This work presents axial ion velocity measurements within the acceleration channel of the Busek Co. Inc. BHT-200 200 W laboratory Hall thruster derived from laser-induced fluorescence measurements of the  $5d[4]7/2-6p[3]5/2$  xenon ion excited state transition. Acceleration channel centerline ion velocities were measured for one nominal and six related cases. These six cases were chosen to be representative of small variations of the applied propellant flow, magnetic field, and discharge charge potential from the nominal condition. These deviations in operating parameters translate into changes in the plasma density, electron transport, and applied electric field, respectively. The effect of varying the magnetic field, hence influencing the electron transport, is to adjust the location of the internal ion acceleration. Increasing the anode propellant flow, which proportionally increases the plasma density and also influences the electron transport, appears to shift the acceleration upstream. Increasing discharge potential increases ion acceleration proportionally. Preliminary examination of the fluorescence traces, which have been previously shown to be representative of the ion velocity distributions, are also undertaken. From these data, it is possible to estimate internal axial electric fields and identify regions of ion acceleration and creation.

DTIC

*Hall Thrusters; Velocity Measurement; Xenon*

**20080002811** Defense Contract Management Agency - Twin Cities, Fort Snelling, MN USA

**Modulated Pulsed Laser Sources for Imaging Lidars**

Remington, Scott; Battle, Philip; Oct 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N68335-07-C-0289

Report No.(s): AD-A473651; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473651>

This report summarizes work performed under Navy SBIR topic #N07-036 demonstrating the feasibility of using a pulsed 1064nm laser diode to create pulses at 500 kHz with pulsewidths of 20-25ns that are modulated at RF frequencies using an electro-optic modulator based on engineered nonlinear optical material. The modulated pulses are then amplified using a

single-stage fiber amplifier and data is provided showing that powers of 10-13W will be ultimately output. Second harmonic generation from the amplifier output to produce 5W at 332nm is possible using bulk engineered nonlinear optical material. Through the choice of specific laser diode technology, the pulsed output linewidth will remain narrow enough to allow efficient doubling through quasi phase matching while being sufficiently broadened to prevent parasitic processes such as stimulated Brillouin scattering during amplification. The key benefits of this approach include wide latitude in operational pulse rate, pulse width, and modulating RF frequency while remaining in a compact, rugged package.

DTIC

*Imaging Techniques; Optical Radar; Pulsed Lasers*

**20080002887** Aerospace Corp., El Segundo, CA USA

**High-Performance 1645-nm Er: YAG Laser**

Chen, Da-Wun; Rose, Todd S; Beck, Steven M; Birnbaum, Milton; Sep 25, 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8802-04-C-0001

Report No.(s): AD-A473767; TAC-TR-2007(8555)-6; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The efficiency and output of the resonantly fiber-laser-pumped Er: AYG laser at 1645 nm using 0.25% doped crystal out-performed the 0.5% doped crystal. In addition to the reported decrease in efficiency because of cooperative up conversion, a significant loss of laser output during Q-switched operation was observed and identified as two-photon absorption. This is deleterious in the short-pulse, high-intensity operational regime.

DTIC

*YAG Lasers; High Power Lasers*

### 37

## MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

**20080000851** NASA Glenn Research Center, Cleveland, OH, USA

**Relation between Hertz Stress-Life Exponent, Ball-Race Conformity, and Ball Bearing Life**

Zaretsky, Erwin V.; Poplawski, Joseph V.; Root, Lawrence E.; May 07, 2006; 32 pp.; In English; 61st STLE Annual Meeting, 7-11 May 2006, Calgary, Canada; Original contains black and white illustrations

Contract(s)/Grant(s): 561581.02.07.03.03.03; Copyright; Avail.: CASI: A03, Hardcopy

ANSI/ABMA and ISO standards based on Lundberg-Palmgren bearing life theory are normalized for ball bearings having inner- and outer-race conformities of 52 percent (0.52) and made from pre-1940 bearing steel. The Lundberg-Palmgren theory incorporates an inverse 9th power relation between Hertz stress and fatigue life for ball bearings. The effect of race conformity on ball set life independent of race life is not incorporated into the Lundberg-Palmgren theory. In addition, post-1960 vacuum-processed bearing steel exhibits a 12th power relation between Hertz stress and life. The work reported extends the previous work of Zaretsky, Poplawski, and Root to calculate changes in bearing life, that includes the life of the ball set, caused by race conformity, Hertz stress-life exponent, ball bearing type and bearing series. The bearing fatigue life in actual application will usually be equal to or greater than that calculated using the ANSI/ABMA and ISO standards that incorporate the Lundberg-Palmgren theory. The relative fatigue life of an individual race is more sensitive to changes in race conformity for Hertz stress-life exponent  $n$  of 12 than where  $n = 9$ . However, when the effects are combined to predict actual bearing life for a specified set of conditions and bearing geometry, the predicted life of the bearing will be greater for a value of  $n = 12$  than  $n = 9$ .

Author

*Ball Bearings; Fatigue Life; Steels*

**20080000960** Army Cold Regions Research and Engineering Lab., Hanover, NH USA

**Fifty Years of Soviet and Russian Drilling Activity in Polar and Non-Polar Ice: A Chronological History**

Ueda, Herbert T; Talalay, Pavel G; Oct 2007; 145 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472548; ERDC/CRREL-TR-07-20; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472548>

Soviet and Russian drilling activity in ice began in 1955 while conducting temperature surveys on a glacier in Franz-Josef

Land in the Arctic and continued to 1960 on the glaciers of the polar Ural and the northern Tien Shen mountain ranges. In 1956 the first Complex Antarctic Expedition (CAE) was formed and the first Antarctic drilling was conducted in October of 1956 near Mirny Station. Later, the expeditions were referred to as Soviet Antarctic Expeditions (SAE) and Russian Antarctic Expeditions (RAE). Early efforts were conducted with hand drilling equipment followed by mechanical rotary and percussion drilling techniques. Thermal (flame and thermal electric) boring drills and later thermal coring drills eventually culminated in drills of the TELGA type for thermal drilling deep, dry holes. One such hole reached a depth of over 900 m at Vostok. Use of TBZS type thermal drills for drilling in fluid-filled holes were also developed, as was a technique using anti-freeze to dissolve the melt water formed, the dilute solution then remaining in the hole to provide the necessary hydrostatic balance. An electro-mechanical drill KEMS was first introduced on Vavilov Glacier, Severnaya Zemlya (Russian Arctic) in 1984 and then in 1989 at Vostok Station. Five major holes have been drilled at Vostok, the last one stopped in 2006 (RAE 51) at a depth of 3650 m, 100 m above Lake Vostok. This report chronologically summarizes the Soviet and Russian efforts over the last 50 years.

DTIC

*Drilling; Glaciers; Ice; Russian Federation*

**20080001446** NASA Glenn Research Center, Cleveland, OH, USA

**Reexamination of Ball-Race Conformity Effects on Ball Bearing Life**

Zaretsky, Erwin V.; Poplawski, Joseph V.; Root, Lawrence E.; [2007]; 32 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/TM-2007-213635; E-15118-2; Copyright; Avail.: CASI: [A03](#), Hardcopy

The analysis in this report considers the life of the ball set as well as the respective lives of the races to reassess the effect of ball-race conformity on ball bearing life. The related changes in ball bearing life are incorporated in life factors that can be used to modify the bearing predicted life using the Lundberg-Palmgren equations and the ANSI/ABMA and ISO Standards. Two simple algebraic relationships were established to calculate life factors LF(sub c) to determine the effect of inner- and outer-race conformity combinations on bearing L(sub 10) life for deepgroove and angular-contact ball bearings, respectively. Depending on the bearing type and series as well as conformity combinations, the calculated life for deep-groove ball bearings can be over 40 percent less than that calculated by the Lundberg-Palmgren equations. For angular-contact ball bearings, the life can vary between +16 and -39 percent from that calculated by the Lundberg-Palmgren equations. Comparing the two ball bearing types, the life factors LF(sub c) for the deep-groove bearings can be as much as 40 percent lower than that for angular-contact ball bearings.

Author

*Ball Bearings; Fatigue Life; Life (Durability); Prediction Analysis Techniques*

**20080001675** Weston (Roy F.), Inc., West Chester, PA USA

**Report of Sampling and Analysis Results: Clementon Army Housing Units Clementon, New Jersey**

Weston, Roy F; Apr 1991; 82 pp.; In English

Contract(s)/Grant(s): W-31-109-ENG-38

Report No.(s): AD-A473154; CETHA-BC-CR-90132; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: <http://hdl.handle.net/100.2/ADA473154>

Roy F. Weston, Inc. has conducted a sampling and analysis program of the Army housing property located in Clementon, New Jersey. The objectives of this effort include further characterization of environmental contamination identified in an enhanced preliminary assessment carried out in 1989. The specific activities performed at this site were identification, evaluation of the condition, and collection of samples from specific suspected asbestos-containing materials, including floor tiles, pipe run and pipe fitting insulation, dust in the ductwork, and exterior siding, where present, collection and analysis of soil samples from utility trenches. These evaluations were necessary to clarify potential environmental issues identified in the earlier report, prior to the sale or realignment of the property.

DTIC

*Contamination; Environmental Surveys; Sampling*

**20080002233** Naval Undersea Warfare Center, Newport, RI USA

**Multi-Cycle Undersea Power System**

Dunn, Paul M; Oct 12, 2006; 12 pp.; In English

Report No.(s): AD-D020312; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This patent application describes a method of operating an internal combustion engine in a semi-closed or 'exhaust' cycle.

The exhaust cycle is semi-closed in that no atmospheric air is introduced into the internal combustion engine. The engine can be switched back to an open or 'air' cycle, increasing fuel efficiency.

DTIC

*Internal Combustion Engines; Underwater Vehicles; Power Efficiency*

**20080002286** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Study of Radiographic Linear Indications and Subsequent Microstructural Features in Gas Tungsten Arc Welds of Inconel 718**

Walley, J. L.; Nunes, A. C.; Clouch, J. L.; Russell, C. K.; September 2007; 48 pp.; In English; Original contains color and black and white illustrations

Report No.(s): NASA/TM-2007-215075; M-1201; Copyright; Avail.: CASI: [A03](#), Hardcopy

This study presents examples and considerations for differentiating linear radiographic indications produced by gas tungsten arc welds in a 0.05-in-thick sheet of Inconel 718. A series of welds with different structural features, including the enigma indications and other defect indications such as lack of fusion and penetration, were produced, radiographed, and examined metallographically. The enigma indications were produced by a large columnar grain running along the center of the weld nugget occurring when the weld speed was reduced sufficiently below nominal. Examples of respective indications, including the effect of changing the x-ray source location, are presented as an aid to differentiation. Enigma, nominal, and hot-weld specimens were tensile tested to demonstrate the harmlessness of the enigma indication. Statistical analysis showed that there is no difference between the strengths of these three weld conditions.

Author

*Gas Tungsten Arc Welding; Inconel (Trademark); Metallography; Welded Joints; Weld Strength*

**20080002339** Army Research Lab., Cleveland, OH, USA

**Overcoming Present-Day Powerplant Limitations Via Unconventional Engine Configurations**

Meitner, Peter L.; November 27, 2006; 8 pp.; In English; 25th Army Science Conference, 27-30 Nov. 2006, Orlando, FL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 861726.01.03.0521.01; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002339>

The Army Research Laboratory's Vehicle Technology Directorate is sponsoring the prototype development of three unconventional engine concepts - two intermittent combustion (IC) engines and one turbine engine (via SBIR (Small Business Innovative Research) contracts). The IC concepts are the Nutating Engine and the Bonner Engine, and the turbine concept is the POWER Engine. Each of the three engines offers unique and greatly improved capabilities (which cannot be achieved by present-day powerplants), while offering significant reductions in size and weight. This paper presents brief descriptions of the physical characteristics of the three engines, and discusses their performance potentials, as well as their development status.

Author

*Engine Tests; Engine Design; Turbine Engines; Nutation; Combustion Chambers; Electric Power Plants*

**20080002551** Army Research Lab., Aberdeen Proving Ground, MD USA

**Design and Evaluation of an Electromechanical Actuator for Projectile Guidance**

Celmins, Ilmars; Sep 2007; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473694; ARL-MR-0672; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An ongoing Army requirement is for actuators for guided munitions. This report describes an electromechanical actuator concept using a tubular solenoid. Preliminary test results reveal the capabilities and limitations of the actuator concept.

DTIC

*Actuators; Electromechanical Devices; Guidance (Motion); Projectiles*

**20080012210** Cambridge Thermionic Corp., Cambridge, MA USA

**Rotor balancing apparatus and system**

Lyman, Frank, Inventor; Lyman, Joseph, Inventor; April 27, 1976; 6 pp.; In English

Patent Info.: Filed March 3, 1971; US-PATENT-3,952,602; US-PATENT-APPL-SN-120393; No Copyright; Avail.: CASI:

[A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012210>

Rotor balancing apparatus and a system comprising balance probes for measuring unbalance at the ends of a magnetically



suspended rotor are disclosed. Each balance probe comprises a photocell which is located in relationship to the magnetically suspended rotor such that unbalance of the rotor changes the amount of light recorded by each photocell. The signal from each photocell is electrically amplified and displayed by a suitable device, such as an oscilloscope.

Official Gazette of the U.S. Patent and Trademark Office

*Balancing; Magnetic Suspension; Measuring Instruments; Rotors*

**20080012221** California Inst. of Tech., Pasadena, CA USA

**Long stroke pump**

Perkins, Gerald S., Inventor; Moore, Nicholas R., Inventor; March 20, 1979; 5 pp.; In English

Patent Info.: Filed March 4, 1977; US-PATENT-4,145,165; US-PATENT-APPL-SN-774229; No Copyright; Avail.: CASI:

A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012221>

A very high pressure pump apparatus which minimizes wear on the seals thereof and on valves connected thereto, by utilizing a very long stroke piston rod whose opposite ends are received in long cylinders. An electric motor which drives the rod, includes a rotor with a threaded aperture that receives a long threaded middle portion of the rod, so that as the rotor turns it advances the rod.

Official Gazette of the U.S. Patent and Trademark Office

*High Pressure; Pistons; Rods; Valves; Wear*

**20080012249** Radio Corp. of America, New York, NY USA

**Mounting structure**

Ganssle, Eugene Robert, Inventor; Scott, Ralph Richard, Inventor; Williams, Richard Jean, Inventor; September 26, 1978; 11 pp.; In English

Contract(s)/Grant(s): NAS5-20644

Patent Info.: Filed December 14, 1976; US-PATENT-4,116,263; US-PATENT-APPL-SN-750401; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012249>

A mounting platform for heat producing instruments operated in a narrow equilibrium temperature range comprises a grid-like structure with relatively large openings therein. The instruments are secured to and thermally coupled with the grid surface facing the instruments. Excess heat from the instruments is selectively radiated to the ambient through openings in the grid, the grid surfaces at these openings exhibiting low thermal emissivity and adsorptivity. The remainder of the grid is maintained at the equilibrium temperature and is covered with a thermal insulating blanket. Thus, the entire system including the platform and instruments is maintained substantially isothermal, whereby the instruments remain in fixed physical relationship to one another.

Official Gazette of the U.S. Patent and Trademark Office

*Mounting; Openings; Emissivity; Absorptivity; Thermal Insulation*

**20080012262** Nelson and Johnson Engineering, Inc., Boulder, CO USA

**Manual compactor**

Stevenson, Grant E., Inventor; December 4, 1979; 6 pp.; In English

Contract(s)/Grant(s): NAS9-14686

Patent Info.: Filed August 11, 1977; US-PATENT-4,176,597; US-PATENT-APPL-SN-823565; No Copyright; Avail.: CASI:

A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012262>

A manual compactor having two handles each pivoted at one end for movement through adjacent arcs toward and away from each other, such reciprocating activation motion being translated into rotary motion in a single direction by means of ratchet and pawl arrangements about the pivot shaft of each handle, and thenceforth to rotary motion of opposing screws one each of which is driven by each handle, which in turn act through ball nut structures to forcibly draw together plates with force sufficient for compacting, the handles also having provisions for actuating push rod within the handles for the purpose of disengaging the pawls from the ratchets thereby allowing retraction through spring loading of the plates and repositioning of the apparatus for subsequent compacting.

Official Gazette of the U.S. Patent and Trademark Office

*Handles; Reciprocation; Compacting*

**20080012273** California Inst. of Tech., Pasadena, CA USA

**Fast acting check valve**

Perkins, Gerald S., Inventor; April 24, 1979; 5 pp.; In English

Patent Info.: Filed September 2, 1977; US-PATENT-4,150,925; US-PATENT-APPL-SN-830212; No Copyright; Avail.:

CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012273>

A check valve which closes more rapidly to prevent wearing of the valve seat and of the valve member that seals thereagainst, including a solenoid or other actuator that aids the normal spring to quickly close the valve at approximately the time when downpath fluid flow would stop, the actuator then being deenergized. The control circuit that operates the actuator can include a pair of pressure sensors sensing pressure both upstream and downstream from the valve seat. Where the valve is utilized to control flow to or from a piston pump, energization of the actuator can be controlled by sensing when the pump piston reaches its extreme of travel.

Official Gazette of the U.S. Patent and Trademark Office

*Actuators; Seats; Solenoids; Valves*

**20080012282** NASA, Washington, DC USA

**Two-stage sorption type cryogenic refrigerator including heat regeneration system**

Jones, Jack A., Inventor; Wen, Liang-Chi, Inventor; Bard, Steven, Inventor; October 24, 1989; 11 pp.; In English

Patent Info.: Filed January 31, 1989; US-PATENT-4,875,346; US-PATENT-APPL-SN-304149; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012282>

A lower stage chemisorption refrigeration system physically and functionally coupled to an upper stage physical adsorption refrigeration system. Waste heat generated by the lower stage cycle is regenerated to fuel the upper stage cycle thereby greatly improving the energy efficiency of a two-stage sorption refrigerator. The two stages are joined by disposing a first pressurization chamber providing a high pressure flow of a first refrigerant for the lower stage refrigeration cycle within a second pressurization chamber providing a high pressure flow of a second refrigerant for the upper stage refrigeration cycle. The first pressurization chamber is separated from the second pressurization chamber by a gas-gap thermal switch which at times is filled with a thermoconductive fluid to allow conduction of heat from the first pressurization chamber to the second pressurization chamber.

Official Gazette of the U.S. Patent and Trademark Office

*Cryogenics; Refrigerators; Chemisorption*

**20080012290** NASA, Washington, DC USA

**Apparatus for waste collection and storage**

Thornton, Jr., William E., Inventor; Whitmore, Henry B., Inventor; October 3, 1989; 16 pp.; In English

Patent Info.: Filed April 7, 1987; US-PATENT-4,870,709; US-PATENT-APPL-SN-035401; No Copyright; Avail.:

CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012290>

An apparatus for collection of fecal matter designed to operate efficiently in a zero gravity environment. The system comprises a waste collection area within a body having a seat opening. Low pressure within the waste collection area directs fecal matter away from the user's buttocks and prevents the escape of undesirable gases. The user actuates a piston covered with an absorbent pad that sweeps through the waste collection area to collect fecal matter, scrub the waste collector area, press the waste against an end of the waste collection area and retracts, leaving the used pad. Multiple pads are provided on the piston to accommodate multiple uses of the system. Also a valve allows air to be drawn through the body, which valve will not be plugged with fecal matter. A sheet feeder feeds fresh sheets of absorbent pad to a face of the piston with each actuation.

Official Gazette of the U.S. Patent and Trademark Office

*Weightlessness; Human Wastes*

### QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

**20080000521** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

#### **Supplier Outreach and Process Control (SOPC) and Supplier Rating Initiative (SRI)**

Crenshaw, Harrel; June 3, 2003; 30 pp.; In English; Assurance Technology Symposium, 3-5 Jun. 2003, Cleveland, OH, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40412>

The viewgraph presentation presents an overview of NASA's Supplier Outreach and Process Control (SOPC) and Supplier Risk Initiatives. The discussion of the SOPC examines its importance, current groups who are involved, provides a mission statement, and describes outreach activities and how suppliers are selected. The discussion of the Supplier Risk Initiative examines the variety of ways that integrity, availability, and assurance factor in to supplier risk and describes a new supplier rating program.

CASI

*Quality Control; Ratings; Supplying; NASA Programs; Commerce*

### STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

**20080000363** General Accounting Office, Washington, DC USA

#### **Defense Infrastructure: Overseas Master Plans Are Improving, But DOD Needs to Provide Congress Additional Information about the Military Buildup on Guam**

Lepore, Brian J; Little, Mark; Alcoser, Nelsie; Lenane, Kate; Prochaska, Erika; Tomlinson, Roger; Weissman, Cheryl; Sep 2007; 52 pp.; In English

Report No.(s): AD-A472147; GAO-07-1015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472147>

Over the next several years, implementation of the Department of Defense's (DoD) Integrated Global Presence and Basing Strategy will result in the realignment of U.S. forces and the construction of new facilities costing billions of dollars at installations overseas. The Senate and House reports accompanying the fiscal year 2004 military construction appropriation bill directed GAO to monitor DoD's overseas master plans and to provide congressional defense committees with assessments each year. The Senate report accompanying the fiscal year 2007 military construction appropriation bill directed GAO to review DoD's master planning effort for Guam as part of these annual reviews. This report, first, examines how the overseas plans have changed and the extent to which they address the challenges faced by DoD and, second, assesses the status of DoD's planning effort and the challenges associated with the buildup of military forces and infrastructure on Guam. GAO is not recommending executive action. However, Congress should require DoD to report on residual value and U.S. Pacific Command's (PACOM) training limitations, as well as periodically on its planning efforts for Guam and efforts to address various challenges. DoD believes congressional action is not necessary.

DTIC

*Construction; Defense Program; Guam; Planning*

**20080000370** General Accounting Office, Washington, DC USA

#### **Military Base Realignments and Closures: Plan Needed to Monitor Challenges for Completing More Than 100 Armed Forces Reserve Centers**

Lepore, Brian J; Holman, Barry; Talbott, Laura; Arbogast, Shawn; Beers, Rachel; Coleman, Grace; Edwards, Jennifer; Matta, Julie; Perdue, Charles; Sep 2007; 39 pp.; In English

Report No.(s): AD-A472162; GAO-07-1040; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472162>

The Army is implementing 44 base realignment and closure (BRAC) recommendations to construct 125 new Armed Forces Reserve Centers (AFRC) and close 387 existing reserve components facilities. The Department of Defense (DoD)

expects the new AFRCs to increase recruiting and retention and create greater efficiencies by fostering jointness and consolidating functions. GAO did the following: (1) assessed the extent to which DoD's cost and savings estimates to implement the recommendations have changed from BRAC Commission projections, and (2) determined the extent to which the Army has identified potential challenges that could affect BRAC implementation and has developed a plan to address these challenges. GAO analyzed DoD's publicly available BRAC budget data and interviewed officials at Army offices, including Reserve Command, National Guard Bureau, and the National Guard in five states. This report, prepared under the Comptroller General's authority to initiate evaluations, is one of a series related to the BRAC 2005 round. GAO is recommending that the Secretary of Defense direct the Army to develop a plan for bringing together various stakeholders to monitor and address potential challenges. DoD partially concurred with GAO's recommendation.

DTIC

*Armed Forces; Construction; Cost Estimates; Management Planning; Reserves*

**2008000381** General Accounting Office, Washington, DC USA

**Defense Infrastructure: Challenges Increase Risks for Providing Timely Infrastructure Support for Army Installations Expecting Substantial Personnel Growth**

Lepore, Brian J; Holman, Barry W; Reifsnnyder, James R; Alcocer, Nelsie S; Coleman, Grace A; Lively, Nancy T; Meeks, Richard W; Nielson, David F; Tomlinson, Roger L; Sep 2007; 48 pp.; In English

Report No.(s): AD-A472180; GAO-07-1007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472180>

The Army expects significant personnel growth, more than 50 percent in some cases, at 18 domestic bases through 2011 because of the effect of implementing base realignment and closure (BRAC), overseas force rebasing, and force modularity actions. This growth creates the need for additional support infrastructure at these bases and in nearby communities. Military construction costs of over \$17 billion are expected for new personnel, and communities will incur infrastructure costs as well. GAO prepared this report under the Comptroller General's authority to conduct evaluations on his own initiative. It addresses the following: (1) the challenges and associated risks the Army faces in providing for timely infrastructure support at its gaining installations, and (2) how communities are planning and funding for infrastructure to support incoming personnel and their families. GAO analyzed personnel restationing numbers, discussed planning efforts with Army and community officials, and visited nine of the larger gaining bases and nearby communities. To better facilitate infrastructure planning, GAO recommends that DoD determine the causes for the variances in restationing numbers and ensure that agreement is reached within the Army on these numbers. DoD partially concurred with both recommendations.

DTIC

*Military Personnel; Personnel; Planning; Risk*

**2008000929** Diwan Coll., Tainan, Taiwan, Province of China

**Shear-Thinning Effects in Annular-Orifice Viscous Fluid Dampers**

Hou, Chien-Yuan; Hsu, Deh-Shiu; Lee, Yung-Feng; Chen, Hsing-Yuan; Lee, Junn-Deh; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 275-287; In English; See also [2008000927](#)

Contract(s)/Grant(s): NSC-93-2211-E434-008; Copyright; Avail.: Other Sources

The number of construction projects using viscous fluid dampers for the purpose of seismic energy dissipation has been increasing in recent years. Usually, resisting forces provided by a viscous fluid damper are nonlinearly related to the damper operation velocity. In the current study, the mechanism of the nonlinear behavior is studied. It is found that the fluid shear rate in the orifices of a damper is high enough to cause shear thinning of the fluid, that is, the non-Newtonian behavior of the fluid must be considered to capture the viscous damper's non-linearity. Carreau's equation giving the shear-thinning relationship between fluid viscosity and shear rate is employed in a finite element model. The model is used to calculate the fluid dynamics in viscous dampers and the calculated results successfully explain the nonlinear behavior. Effects of the damper geometry and the fluid viscosity on the damper non-linearity are also tested and discussed. Again, the trend shown in experimental results can be fully explained by the shear-thinning concept. In addition, the behavior of a damper operated at ultra high velocity is addressed.

Author

*Energy Dissipation; Finite Element Method; Mathematical Models; Seismic Energy; Viscosity; Viscous Fluids; Earthquake Resistant Structures; Viscous Damping*

**2008000931** Academia Sinica, Taipei, Taiwan, Province of China

**A Probabilistic Seismic Risk Analysis of Building Losses in Taipei: An Application of HAZ-Taiwan with its Pre-Processor and Post-Processor**

Shaw, Daigee; Yeh, Chin-Hsun; Jean, Wen-Yu; Loh, Chin-Hsiung; Kuo, Yen-Lien; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 287-297; In English; See also [2008000927](#); Copyright; Avail.: Other Sources

We employ a probabilistic seismic risk analysis to estimate exceedance probability curves, average annual loss (AAL) and probable maximum loss (PML) of building stocks in Taipei. It utilizes an event-driven loss estimation model, HAZ-Taiwan, and develops its pre-processing and post-processing software modules. The pre-processing module establishes a set of hazard-consistent scenario earthquakes. The HAZ-Taiwan model estimates hazards, vulnerabilities and economic losses for each scenario earthquake. The aggregate and occurrence exceedance probability curves for building losses and their confidence intervals are simulated using the Monte Carlo simulation in the postprocessing module. It is found that the exceedance probability of an aggregate loss of USD 1.22 billion is 0.001. This amount of loss is approximately 2.78% of the total building stocks in Taipei. Its 5%-95% confidence intervals range from USD 1.13- 1.31 billion. The average annual loss of buildings in Taipei is currently USD 32 million. or approximately 0.07% of the total building stocks.

Author

*Estimates; Monte Carlo Method; Earthquake Damage*

**2008000948** General Accounting Office, Washington, DC USA

**Rebuilding Iraq: Reconstruction Progress Hindered by Contracting, Security, and Capacity Challenges**

Walker, David M; Feb 15, 2007; 33 pp.; In English

Report No.(s): AD-A472277; GAO-07-426T; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472277>

The Department of Defense (DoD) has relied extensively on contractors to undertake major reconstruction projects and provide support to its deployed forces, but these efforts have not always achieved desired outcomes. Further, the Iraqi government must be able to reduce violence, sustain reconstruction progress, improve basic services, and make a positive difference in the daily lives of the Iraqi people. This statement discusses the following: (1) factors affecting DoD's ability to promote successful acquisition outcomes on its contracts for reconstruction and for support to deployed forces in Iraq, (2) the deteriorating security situation and the capabilities of the Iraqi security forces, and (3) issues affecting the Iraqi government's ability to support and sustain future reconstruction progress. The testimony is based upon GAO's work on Iraq reconstruction and stabilization efforts, DoD contracting activities, and DoD's use of support contractors spanning several years. This work was conducted in accordance with generally accepted government auditing standards. GAO is making no new recommendations in this testimony. GAO has previously made numerous recommendations to improve DoD's management and use of contracts. DOD has generally agreed with these recommendations and has taken some actions to implement them. DTIC

*Contract Management; Defense Program; Iraq; Security*

**2008000949** General Accounting Office, Washington, DC USA

**Securing, Stabilizing, and Rebuilding Iraq: Key Issues for Congressional Oversight**

Barton, Nanette; Borseth, Ann; Bruno, David; Byers, Donna; Cain, Dan; Christoff, Joseph A; Coffey, Carole; Cothorn, Lynn; Cross, Tracey; D'Agostino, Davi; Jan 2007; 121 pp.; In English

Report No.(s): AD-A472278; GAO-07-308SP; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472278>

As the USA reviews its plans to secure, stabilize, and rebuild Iraq, the Comptroller of the U.S. has compiled these issue papers for consideration of the 110th Congress in developing their oversight agenda and analyzing the President's revised strategy for Iraq. The papers are based on the continuing work of the GAO and on the 67 Iraq-related reports and testimonies it has provided to Congress since May 2003. Enclosure I: More Comprehensive U.S. Strategy Needed to Achieve Goals and Address Challenges in Iraq; Enclosure II: U.S. Commitments Involve Significant Resources, but DoD Cost Reports and Budgets Limit Transparency; Enclosure III: Security Conditions Have Deteriorated as Iraq Has Assumed Additional Security Responsibilities; Enclosure IV: Assessing the Capabilities of the Iraqi Security Forces Is Critical; Enclosure V: DoD May Be Unable to Ensure That U.S.-Funded Equipment Has Reached Iraqi Security Forces; Enclosure VI: The Iraqi Government Needs to Staff an Effective Civil Service and Fight Corruption; Enclosure VII: Ministry Capacity Development Efforts Need Integrated Plan; Enclosure VIII: Several Factors Affect Iraqi Ministry Efforts to Spend Capital Budgets; Enclosure IX: Iraq Owes Significant Foreign Debt and Faces Challenges in Meeting IMF Conditions; Enclosure X: U.S. Efforts to Restore Iraq's

Oil Sector Have Been Slowed by Major Challenges; Enclosure XI: U.S. Efforts to Improve Iraq's Electricity Sector Have Been Constrained by Security, Management, and Funding Challenges; Enclosure XII: Extended Operations Have Had Significant Consequences for the U.S. Military; Enclosure XIII: Securing Munitions Sites and Alleviating Armor Shortages Have Been Serious Problems; Enclosure XIV: Deficiencies in Supply Support for U.S. Ground Forces Have Resulted in Shortages of Critical Items; Enclosure XV: DoD Needs to Improve Its Capacity to Manage Contractors; Enclosure XVI: Objectives, Scope, and Methodology; and Enclosure XVII: Staff Acknowledgments.

DTIC

*Iraq; Security; Stability; Stabilization; United States*

**2008001200** Wyoming Univ., Laramie, WY USA

**Precision Composite Space Structures**

Garnich, Mark R; Long, David; Fitch, John F; Venkata, Akula M; Liu, Pu; Oct 15, 2007; 306 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0445

Report No.(s): AD-A472941; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project was aimed at developing analytical approaches to improving and better understanding the dimensional stability of composite space structures under thermal environments and changing material behavior due to microscopic damage. A comprehensive review of the literature on damage modeling of polymer matrix composite laminates was conducted. Damage due to matrix cracking was characterized using micromechanics. Aspects of predicting and utilizing degraded properties at the fiber and matrix level were studied. A computational approach to optimization of structure dimensional stability by introduction of 'anti-distortion appliques' was developed for minimizing thermally induced instability. The concept involves adding material to offset and eliminate measured instabilities. The concept was demonstrated but the approach is limited by the current lack of precision measurement systems for large structures.

DTIC

*Composite Structures; Large Space Structures; Spacecraft Structures*

**20080012207** Rockwell International Corp., El Segundo, CA USA

**Shear flexibility for structures**

Stangeland, Maynard L., Inventor; May 11, 1976; 7 pp.; In English

Patent Info.: Filed September 11, 1974; US-PATENT-3,956,543; US-PATENT-APPL-SN-504927; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012207>

This device comprises a flexible sheet member having cross convolutions oriented 45.degree. to the shear vector with spherical reliefs at the convolution junctions. The spherical reliefs are essential to the shear flexibility by interrupting the principal stress lines that act along the ridges of the convolutions. The spherical reliefs provide convolutions in both directions in the plane of the cross-convolution ridges.

Official Gazette of the U.S. Patent and Trademark Office

*Elastic Sheets; Flexibility; Shear Properties*

**20080012238** Rockwell International Corp., El Segundo, CA USA

**Shear flexibility for structures**

Stangeland, Maynard L., Inventor; August 23, 1977; 7 pp.; In English

Patent Info.: Filed January 26, 1976; US-PATENT-4,044,186; US-PATENT-APPL-SN-652594; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012238>

This device comprises a flexible sheet member having cross convolutions oriented 45.degree. to the shear vector with spherical reliefs at the convolution junctions. The spherical reliefs are essential to the shear flexibility by interrupting the principal stress lines that act along the ridges of the convolutions. The spherical reliefs provide convolutions in both directions in the plane of the cross-convolution ridges.

Official Gazette of the U.S. Patent and Trademark Office

*Flexibility; Shear Stress; Structures*

**GEOSCIENCES (GENERAL)**

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

**2008000842** NASA Langley Research Center, Hampton, VA, USA

**The Impact of Transpacific Transport of Mineral Dust in the USA**

Fairlie, T. Duncan; Jacob, Daniel J.; Park, Rokjin J.; May 1, 2006; 32 pp.; In English; Submitted to Atmospheric Environment Journal to be published in volume 41, no. 6, pp. 1251-1266, February 2007; Original contains color and black and white illustrations

Contract(s)/Grant(s): 281945.02.41.01.09; Copyright; Avail.: Other Sources

We use a global chemical transport model (GEOS-Chem) to estimate the impact of transpacific transport of mineral dust on aerosol concentrations in North America during 2001. We test two dust mobilization schemes (GOCART and DEAD) and find that the best simulation of observations is obtained by a combination of the two, restricting dust emissions to year-round arid areas but including a significant wind threshold for dust mobilization. The model captures the magnitude and seasonal cycle of observed surface dust concentrations over the northern Pacific. It simulates the free tropospheric outflow of dust from Asia observed in the TRACE-P and ACE-Asia aircraft campaigns of spring 2001. It reproduces the timing and distribution of Asian dust outbreaks in North America during April - May. Beyond these outbreaks we find persistent Asian fine dust (averaging 1.2 micro-g/cu m) in surface air over the western USA in spring, with much weaker influence (0.25 micro-g/cu m) in summer and fall. Asian influence over the eastern USA is 30 - 50% lower. We find that transpacific sources accounted for 40% of the worst dust days in the western USA in 2001.

Author

*Minerals; Dust; United States; Aerosols; Arid Lands*

**20080012157**

**MISR radiometric camera-by-camera Cloud Mask V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIRCCM\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIRCCM_V1)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The RCCM is derived from the radiance values, and is calculated independently for each camera. Therefore, the amount of apparent cloudiness will vary with view angle, with the oblique view angles generally being more cloudy than the near-nadir ones. Since the RCCM is calculated primarily from the radiance values, it does not work well over snow and ice and will usually confuse clear snow/ice with cloud. It works the best over clear-sky ocean, but other surface types are also of quite good quality. The RCCM product also contains a glint mask for each camera, and this mask is set to true whenever the scattering angles indicate that glint could be possible. This glint mask is not masked out over land; users must do this step themselves. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Cameras; Satellite Observation; Remote Sensing; Clouds (Meteorology); Cloud Cover*

**20080012158**

**MISR Level 2 TOA/Cloud Stereo parameters V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCST\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCST_V1)

The MISR Top-of-Atmosphere (TOA)/Cloud Stereo geophysical parameters include stereoscopically-derived cloud motion vectors (winds), cloud-top heights, and an accompanying cloud mask. The Stereo product geophysical parameters include a stereoscopically-derived cloud mask and cloud height on a 1.1 km grid. It also includes cloud motion vectors on a 70.4 km grid. The three types of stereo heights are: the BestWind heights are only calculated for those regions where the

associated wind vectors passed the quality tests. Therefore, they have sparse coverage but since the wind correction is included, these contain our 'best guess' as to what the true heights are. The WithoutWind heights are calculated assuming a constant wind vector of zero. They have almost complete coverage and therefore form a nice 'pretty picture' of the relative cloud heights over small areas. The RawWind heights are a diagnostic product as they are calculated using all available wind vectors (even the bad ones). It is therefore recommended that one only use the Best and Without wind products. It is important to remember that the stereo matchers pick up the layer of maximum contrast, which is not necessarily the same as the highest cloud so all the stereo heights are keyed to this level of maximum contrast. Therefore, higher and thinner cirrus layers may not be detected by any of the height fields. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km; Longitude\_Resolution=1.1 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Clouds (Meteorology); Cloud Cover*

### **20080012160**

#### **MISR Geometric Parameters V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB2GEOP\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB2GEOP_V1)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The MISR Level 1B2 Geometric Parameters data product is part of the georectified radiance product. It contains the geometric parameters which measure the sun and view angles at the reference ellipsoid. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=17.6 km; Longitude\_Resolution=17.6 km; Horizontal\_Resolution\_Range=10 km - < 50 km or approximately .09 degree - < .5 degree; Temporal\_Resolution=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing*

### **20080012170**

#### **MISR Level 2 TOA/Cloud Classifier parameters V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCCL\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCCL_V2)

The TOA/Cloud Classifiers contain the Angular Signature Cloud Mask (ASCM), a scene classifier calculated using support vector machine technology (SVM) both of which are on a 1.1 km grid, and cloud fractions at 17.6 km resolution that are available in different height bins (low, middle, high) and are also calculated on an angle-by-angle basis. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=17.6 km; Longitude\_Resolution=17.6 km; Horizontal\_Resolution\_Range=10 km - < 50 km or approximately .09 degree - < .5 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly, Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Clouds (Meteorology); Cloud Cover*



**20080012178**

**MISR Geometric Parameters V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB2GEOP\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB2GEOP_V2)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The MISR Level 1B2 Geometric Parameters data product is part of the georectified radiance product. It contains the geometric parameters which measure the sun and view angles at the reference ellipsoid. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=17.6 km; Longitude\_Resolution=17.6 km; Horizontal\_Resolution\_Range=10 km - < 50 km or approximately .09 degree - < .5 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing*

**20080012185**

**MISR radiometric camera-by-camera Cloud Mask V003**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIRCCM\\_V3](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIRCCM_V3)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The RCCM is derived from the radiance values, and is calculated independently for each camera. Therefore, the amount of apparent cloudiness will vary with view angle, with the oblique view angles generally being more cloudy than the near-nadir ones. Since the RCCM is calculated primarily from the radiance values, it does not work well over snow and ice and will usually confuse clear snow/ice with cloud. It works the best over clear-sky ocean, but other surface types are also of quite good quality. The RCCM product also contains a glint mask for each camera, and this mask is set to true whenever the scattering angles indicate that glint could be possible. This glint mask is not masked out over land; users must do this step themselves. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Cameras; Satellite Observation; Remote Sensing; Clouds (Meteorology); Cloud Cover*

**20080012195**

**International Satellite Cloud Climatology Project (ISCCP) TIROS Operational Vertical Sounder (TOVS) Product in Native (NAT) Format (ISCCP\_TOVS\_NAT)**

[Data Set]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_TOVS\\_NAT](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_TOVS_NAT)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution:

Latitude\_Resolution=280 degree; Longitude\_Resolution=280 degree; Temporal\_Resolution=Daily - < Monthly].

NASA

*Atmospheric Sounding; Satellite Sounding; TIROS N Series Satellites; NOAA 10 Satellite; Satellite Observation; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; NOAA 8 Satellite; NOAA 9 Satellite; Atmospheric Chemistry; Ozone; Atmospheric Temperature; Surface Temperature; Meteorological Parameters; Atmospheric Moisture; Humidity; Water Vapor; Clouds (Meteorology); Atmospheric Pressure; Cloud Cover; Land Surface Temperature*

## 43

### EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

**20080000450** NASA Dryden Flight Research Center, Edwards, CA, USA

#### **Earth Science Capability Demonstration Project**

Cobleigh, Brent; May 10, 2006; 15 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000450>

A viewgraph presentation reviewing the Earth Science Capability Demonstration Project is shown. The contents include: 1) ESCD Project; 2) Available Flight Assets; 3) Ikhana Procurement; 4) GCS Layout; 5) Baseline Predator B Architecture; 6) Ikhana Architecture; 7) UAV Capability Assessment; 8) The Big Picture; 9) NASA/NOAA UAV Demo (5/05 to 9/05); 10) NASA/USFS Western States Fire Mission (8/06); and 11) Suborbital Telepresence.

CASI

*Earth Sciences; Technology Utilization; Teleoperators; Man Machine Systems*

**20080000958** Army Engineer Research and Development Center, Vicksburg, MS USA

#### **Pre-Construction Biogeochemical Analysis of Mercury in Wetlands Bordering the Hamilton Army Airfield (HAAF) Wetlands Restoration Site. Part 2**

Best, Elly P; Fredrickson, Herbert L; Hintelmann, Holger; Clarisse, Olivier; Dimock, Brian; Lutz, Charles H; Lotufo, Gui R; Millward, Rod N; Bednar, Anthony J; Furey, John S; Sep 2007; 222 pp.; In English; Original contains color illustrations Report No.(s): AD-A472540; ERDC/EL-TR-07-21; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472540>

With funding from the Long Term Management Strategy team, the U.S. Army Corps of Engineers (USACE) is working with the San Francisco Basin Regional Water Board, California State Coastal Conservancy, and San Francisco Bay Conservation and Development Commission to reconstruct wetlands at the former Hamilton Army Airfield (HAAF) on San Pablo Bay. This 203-ha site will provide tidal habitat to endangered species such as the clapper rail and the saltmarsh harvest mouse. Because HAAF has subsided well below mean sea level, it will require 8.1 million cubic meters of material to elevate the site to the point where emergent marsh vegetation can become established. This is a critical process that will reestablish natural sediment trapping, marsh building, and physical dynamics. However, wetlands are generally considered a source of monomethylmercury (MeHg) production, and the association of mercury with gold mining legacies of the Bay Basin raises particular concerns. HAAF represents only 203 ha of the additional 26,325 ha of wetlands to be established around the bay between 2005 and 2055. Means to mitigate MeHg magnification in bay aquatic food webs are needed not only for HAAF but other SF Bay restoration sites as well. Those means are currently unknown. This interim technical report describes studies primarily performed in 2004 and 2005 and completed in the first half of 2006. Work during this period focused on (1) site-specific rates of methylation and demethylation, as well as characterizations of sedimentary microbial communities; (2) mercury dynamics in decomposing plant litter; (3) mercury dynamics in food webs; and (4) bioavailability of sediment-associated mercury of existing marsh sediments to macrobenthos. A new time-integrative method for measuring and monitoring mercury cycle-related biogeochemical parameters in marshes was developed, and the role of marsh vegetation as a vector in mercury species transport was quantified.

DTIC

*Aquatic Plants; Biogeochemistry; Construction; Isotopes; Mercury (Metal); Methylation; Military Air Facilities; Restoration; San Francisco Bay (CA); Sediments; Vegetation; Wetlands*

**2008000987** Woods Hole Oceanographic Inst., MA USA

**Seismic and Gravitational Studies of Melting in the Mantle's Thermal Boundary Layers**

Van Ark, Emily M; Jun 2007; 199 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): OCE-0002551; OCR-0002551

Report No.(s): AD-A472608; MIT/WHOI-2007-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472608>

This thesis presents three studies which apply geophysical tools to the task of better understanding mantle melting phenomena at the upper and lower boundaries of the mantle. The first study uses seafloor bathymetry and small variations in the gravitational acceleration over the Hawaii-Emperor seamount chain to constrain the changes in the igneous production of the hot spot melting in the mantle which has created these structures over the past 80 My. The second study uses multichannel seismic reflection data to constrain the location and depth of axial magma chambers at the Endeavour Segment of the Juan de Fuca spreading ridge, and then correlates these magma chamber locations with features of the hydrothermal heat extraction system in the upper crust such as microseismicity caused by thermal cracking and high temperature hydrothermal vent systems observed on the seafloor. The third study uses two-dimensional global pseudospectral seismic wave propagation modeling to characterize the sensitivity of the SPdKS seismic phase to two-dimensional, finite-width ultra-low velocity zones (ULVZs) at the core-mantle boundary. Together these three studies highlight the dynamic complexities of melting in the mantle while offering new tools to understand that complexity.

DTIC

*Gravitation; Melting; Seismology; Thermal Boundary Layer*

**20080001025** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Jan 20, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472695; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472695>

Petroleum prices have risen sharply since early 2004. At the same time, the average level of imports of energy-related petroleum products has risen slightly. The combination of sharply rising prices and a slightly higher level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost could add an estimated \$70 billion to the nation's trade deficit in 2005, depending on how sustainable the recent price increases are. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001026** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; May 12, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472696; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472696>

Petroleum prices have risen sharply since early 2004. At the same time, the average level of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and could add about \$100 billion in 2006, depending on how sustainable the rate of recent price increases is. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001027** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Jun 9, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472697; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472697>

Petroleum prices have risen sharply since early 2004. At the same time, the average level of imports of energy-related

petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and could add \$80-\$100 billion in 2006, depending on how sustainable the rate of recent price increases is. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001028** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Oct 13, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472698; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472698>

Petroleum prices have risen sharply since early 2004. At the same time, the average level of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and could add \$85-\$100 billion in 2006, depending on how sustainable the rate of recent price increases is. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001029** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Nov 14, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472699; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472699>

Petroleum prices have risen sharply since early 2004. At the same time, the average level of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and could add \$80-\$100 billion in 2006, depending on how sustainable the rate of recent price increases is. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001030** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Dec 13, 2006; 7 pp.; In English

Report No.(s): AD-A472700; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472700>

Petroleum prices have risen sharply since early 2005. At the same time, the average level of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and could add another \$60 to \$70 billion in 2006, depending on the course of energy import prices over the remainder of 2006. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001043** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; May 30, 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472721; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472721>

Petroleum prices have risen sharply since early 2005. At the same time, the average level of imports of energy-related petroleum products has fallen slightly. The combination of sharply rising prices and a slightly lower level of imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost added an estimated \$70 billion to the nation's trade deficit in 2005 and \$50 billion in 2006. Imported energy prices moderated in January and February 2007, but began rising again in March and April, following a pattern of rising energy import prices in the spring and summer. This report provides an estimate of the initial impact of rising oil prices on the nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001156** Library of Congress, Washington, DC USA

**U.S. Trade Deficit and the Impact of Rising Oil Prices**

Jackson, James K; Jul 22, 2005; 7 pp.; In English

Report No.(s): AD-A472812; CRS-RS22204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Petroleum prices have risen sharply since early 2004. At the same time, however, the average level of imports of energy-related petroleum products has risen slightly. The combination of sharply rising prices and a slightly elevated level of demand for imports of energy-related petroleum products translates into an escalating cost for those imports. This rising cost could add an estimated \$60 to \$90 billion to the Nation's trade deficit in 2005, depending on how sustainable the recent price increases are. This report provides an estimate of the initial impact of rising oil prices on the Nation's merchandise trade deficit. The report will be updated as warranted by events.

DTIC

*Costs; Crude Oil; Economic Impact; Oils; Petroleum Products; United States*

**20080001234** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Correspondence Search Mitigation Using Feature Space Anti-Aliasing**

Veth, Mike; Pachter, Meir; Jan 2007; 14 pp.; In English

Report No.(s): AD-A473005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Image-aided navigation techniques can determine the navigation solution (position, velocity, and attitude) by observing a sequence of images from an optical sensor over time. This operation is based on tracking the location of stationary objects in multiple images, which requires solving the correspondence problem. This is an active area of research and many algorithms exist which attempt to solve this problem by identifying a unique feature in one image and then searching subsequent images for a feature match. The correspondence problem is plagued by feature ambiguity, temporal feature changes, and also occlusions, which are difficult for a computer to address. Constraining the correspondence search to a subset of the image plane has the dual advantage of increasing robustness by limiting false matches and improving search speed. A number of ad-hoc methods to constrain the correspondence search have been proposed in the literature. In this paper, the correspondence problem itself is carefully analyzed from fundamental optical principles. This development results in a general temporal sampling constraint and also reveals the essential connection between the deleterious effects of temporal aliasing and the ambiguities which plague the correspondence search problem. This temporal image sampling constraint is expressed as a function of the navigation trajectory for elementary camera motions. The predicted sampling rates are on the order of those needed for adaptive optics control systems and require very large bandwidths. The temporal image sampling constraint is then re-evaluated by incorporating inertial measurements. The incorporation of inertial measurements is shown to reduce the required temporal sampling rate to practical levels, which evidences the fundamental synergy between image and inertial sensors for navigation and serves as the basis for a real-time, adaptive, antialiasing strategy.

DTIC

*Image Processing; Inertial Navigation; Pattern Registration; Signal Processing*

**20080001235** RAND Corp., Santa Monica, CA USA

**Installation Mapping Enables Many Missions: The Benefits of and Barriers to Sharing Geospatial Data Assets**

Lachman, Beth E; Schirmer, Peter; Frelinger, David R; Greenfield, Victoria A; Tseng, Michael S; Nichols, Tiffany; Jan 2007; 334 pp.; In English

Contract(s)/Grant(s): DASW01-01-C-0004

Report No.(s): AD-A473006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Installations and environment (I&E) geospatial data assets are being developed, used, and shared for many different Department of Defense (DoD) missions, including installation management, homeland defense, emergency response, environmental management, military health, and war fighting. There are many benefits in effectiveness and efficiency to using and sharing such data. However, there are also barriers that limit the widespread use and sharing of such assets within and outside DoD, including security concerns, lack of on-going high-level program support, lack of data-sharing policies, and lack of any rigorous analysis to prove the benefits of sharing. This monograph assesses the mission effects of sharing I&E geospatial data assets within the business domain and across the business, war fighting, and intelligence mission areas of the DoD Global Information Grid (GIG). It also analyzes the barriers to sharing and recommends some ways to overcome them. This monograph should interest those wishing to use and share geospatial data for DoD missions. It should also interest government policymakers and managers who would like to learn more about geospatial data sharing and use across their respective enterprises.

DTIC

*Geographic Information Systems; Installing*

**20080001774** NASA Langley Research Center, Hampton, VA, USA

**Coordination and Cooperation to Achieve the GEOSS Space Segment: A Systems Approach**

Killough, Brian D., Jr.; November 13, 2007; 5 pp.; In English; CEOS Plenary Meeting: Requirements Analysis and Systems Engineering (Agenda 9.5), 13-15 Nov. 2007, Kona, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 625978.01.03; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001774>

Established in April 2007, the SEO has made significant accomplishments in the support of CEOS and the virtual constellations. These accomplishments include (1) constellation trade studies for Atmospheric Composition and Land Surface Imaging, (2) a new engineering framework for requirements definition, assessment and architecture planning, (3) completion of a draft requirements document and gap analysis for the Atmospheric Composition Virtual Constellation, and (4) the development of a DVD video highlighting CEOS and the Virtual Constellation concept.

Author

*Atmospheric Composition; Earth Surface*

**20080001788** NASA Langley Research Center, Hampton, VA, USA

**The CEOS Constellations: A Framework for Building the Space Component of GEOSS**

Killough, Brian D., Jr.; October 30, 2007; 6 pp.; In English; CRSS/ASPRS 2007 Specialty Conference, 30-31 Oct. 2007, Ottawa, Ontario, Canada; Original contains color illustrations

Contract(s)/Grant(s): WBS 625978.01.03; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001788>

This viewgraph presentation reviews the Committee on Earth Observations Secretariat (CEOS). CEOS was formed to promote coordination between member organizations and cooperation in the development of Earth observing satellites. The Virtual Constellation concept is an approach to facilitate agreements, develop standards, and address shortcomings in the international planning process.

CASI

*Organizations; Earth Observations (From Space)*

**20080002140** Ecology and Environment, Inc., Arlington, VA, USA

**Phase 2 Site Investigations Report, Volume 3, Appendices**

Sep 1994; 888 pp.; In English

Contract(s)/Grant(s): DAAA15-90-D-0012

Report No.(s): AD-A473156; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473156>

Partial contents: Bore Logs, Well Construction Logs, Test Pit Logs, Geotechnical Data, Geophysical Surveys, Analysis

of QA/QC Program, Aquifer Hydraulic Characterization (Slug Testing), Groundwater Model Report, Applicable or Relevant and Appropriate Requirements (ARARS), Sudbury Background Data, Ecological Investigation Field Forms, Rapid Bioassessment Report, IRDMIS Level 3 Data, Legend of Ground Features, Quarter Quality Parameters, Water Level Measurements and Groundwater Elevation Data.

DTIC

*Cavities; Geophysics; Ground Water*

**20080002141** Science Applications International Corp., San Diego, CA USA

**Global Ground Truth Data Set with Waveform and Arrival Data**

Bondar, Istvan; Bergman, Eric; Kohl, Benjamin; Kung, Yu-Long; McLaughlin, Keith; Israelsson, Hans; Engdahl, E R; Jul 30, 2007; 111 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-04-C-0020; Proj-1010

Report No.(s): AD-A473142; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473142>

We present the final results of our three-year research project to produce a high-confidence global GT5 data set. During the course of this project we have developed, tested, and validated the hybrid HDC-RCA (Hypocentroidal Decomposition and Reciprocal Cluster Analysis) methodology to produce new GT5 or better event locations from event clusters. The HDC algorithm uses regional and teleseismic data to estimate precise relative event locations with respect to the cluster centroid. The RCA algorithm uses local data to precisely locate the cluster centroid. We have demonstrated that the HDC-RCA multiple event location methodology is able to produce high-confidence GT5 (epicenter and depth) or better event locations using only a few local stations, without reliance on independent GT information. A posteriori assessment procedures and a priori applicability criteria have been developed and tested to assure the quality and high-confidence of the resulting GT5 events. We have developed a novel, adaptive approach to waveform cross-correlation for improved differential arrival time measurements. The method finds the optimal time-bandwidth product to perform waveform cross-correlation, thus maximizing the similarity between waveforms for a wide range of seismic phases. Correlations are accepted or rejected based on their significance level derived from the estimated time-bandwidth product. We have further developed an error model to estimate the a priori uncertainties in differential time measurements in order to facilitate their inclusion with bulletin arrival time picks in the HDC algorithm. We demonstrated differential times contribute to significant improvements in resolving the relative event locations in the HDC analysis and validated the cross-correlation differential time measurement model.

DTIC

*Ground Truth; Waveforms*

**20080002142** Argonne National Lab., IL, USA

**Master Environmental Plan for Fort Devens, Massachusetts**

Biang, C A; Peters, R W; Pearl, R H; Tsai, S Y; Apr 1992; 296 pp.; In English

Contract(s)/Grant(s): W-31-109-ENG-38

Report No.(s): AD-A473127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473127>

This master environmental plan is based on the results of an environmental assessment conducted at Fort Devens, Massachusetts, by Argonne National Laboratory. It addresses the current status, projected data requirements, and recommended actions for 58 designated sites (referred to as study areas [SAs] or areas of concern). Only one of the SAs, a hazardous waste storage area, is regulated under the Resource Conservation and Recovery Act. Because of the length of time that Fort Devens has been operational, records of some of the activities were not available and some of the SAs could not be located or adequately characterized. For example, several of the south-post landfills date back to the nineteenth century. Proposed initial response actions for the SAs include the following: \* Conduct reconnaissances or geophysical surveys at 16 SAs, \* Collect surface soil samples at 24 SAs, \* Collect surface water and sediment samples at 10 SAs, \* Drill soil borings at 12 SAs, - \* Install new monitoring wells at 11 SAs, \* Collect samples from monitoring wells at 15 SAs, and \* Excavate test pits and sample deeper soil at 4 SAs. Various other actions are recommended for several SAs, including measuring groundwater levels and flow, collecting incinerator ash samples, searching records to obtain additional information, and restricting or monitoring site use. Recommendations for installation-wide studies include characterization of general hydrogeology and surface water quality, soils analyses, and ecological assessments.

DTIC

*Closures; Geology; Soils*

**20080002201** NASA Dryden Flight Research Center, Edwards, CA, USA

**Emergency Response Fire-Imaging UAS Missions over the Southern California Wildfire Disaster**

Cobleigh, Brent R.; December 06, 2007; 25 pp.; In English; Technical Analysis and Applications (TAAC) Conference, 4-7 Dec. 2007, Santa Ana Pueblo, NM, USA; Original contains color illustrations; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002201>

Objectives include: Demonstrate capabilities of UAS to overfly and collect sensor data on widespread fires throughout Western US. Demonstrate long-endurance mission capabilities (20-hours+). Image multiple fires (greater than 4 fires per mission), to showcase extendable mission configuration and ability to either linger over key fires or station over disparate regional fires. Demonstrate new UAV-compatible, autonomous sensor for improved thermal characterization of fires. Provide automated, on-board, terrain and geo-rectified sensor imagery over OTH satcom links to national fire personnel and Incident commanders. Deliver real-time imagery (within 10-minutes of acquisition). Demonstrate capabilities of OTS technologies (GoogleEarth) to serve and display mission-critical sensor data, coincident with other pertinent data elements to facilitate information processing (WX data, ground asset data, other satellite data, R/T video, flight track info, etc).

Derived from text

*Over-the-Horizon Radar; Ground Tests; Fires; Disasters; Communication Satellites; Imaging Techniques; Real Time Operation; Emergencies; Data Processing*

**20080002215** Washington Univ., Seattle, WA, USA

**Testing the MODIS Satellite Retrieval of Aerosol Fine-Mode Fraction**

Anderson, Theodore L.; Wu, Yonghua; Chu, D. Allen; Schmid, Beat; Redemann, Jens; Dubovik, Oleg; Journal of Geophysical Research; September 22, 2005; Volume 110; 16 pp.; In English; Original contains color and black and white illustrations Contract(s)/Grant(s): NAS1-99105; NNG04GM63G; NSF-ATM-0138250; NSF-ATM-0205198; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2005JD005978>

Satellite retrievals of the fine-mode fraction (FMF) of midvisible aerosol optical depth, tau, are potentially valuable for constraining chemical transport models and for assessing the global distribution of anthropogenic aerosols. Here we compare satellite retrievals of FMF from the Moderate Resolution Imaging Spectroradiometer (MODIS) to suborbital data on the submicrometer fraction (SMF) of tau. SMF is a closely related parameter that is directly measurable by in situ techniques. The primary suborbital method uses in situ profiling of SMF combined with airborne Sun photometry both to validate the in situ estimate of ambient extinction and to take into account the aerosol above the highest flight level. This method is independent of the satellite retrieval and has well-known accuracy but entails considerable logistical and technical difficulties. An alternate method uses Sun photometer measurements near the surface and an empirical relation between SMF and the Angstrom exponent, A, a measure of the wavelength dependence of optical depth or extinction. Eleven primary and fifteen alternate comparisons are examined involving varying mixtures of dust, sea salt, and pollution in the vicinity of Korea and Japan. MODIS ocean retrievals of FMF are shown to be systematically higher than suborbital estimates of SMF by about 0.2. The most significant cause of this discrepancy involves the relationship between 5 and fine-mode partitioning; in situ measurements indicate a systematically different relationship from what is assumed in the satellite retrievals. Based on these findings, we recommend: (1) satellite programs should concentrate on retrieving and validating since an excellent validation program is in place for doing this, and (2) suborbital measurements should be used to derive relationships between A and fine-mode partitioning to allow interpretation of the satellite data in terms of fine-mode aerosol optical depth.

Author

*Aerosols; MODIS (Radiometry); Optical Thickness; Geophysics; Algorithms; Satellite Instruments*

**20080002216** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Evaluation of Aerosol Properties over Ocean from Moderate Resolution Imaging Spectroradiometer (MODIS) during ACE-Asia**

Chu, D. A.; Remer, L. A.; Kaufman, Y. J.; Schmid, B.; Redemann, J.; Knobelspiesse, K.; Chern, J.-D.; Livingston, J.; Russell, P. B.; Xiong, X.; Ridgway, W.; Journal of Geophysical Research; April 09, 2005; ISSN 0148-0227; Volume 110; 24 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG04GM63G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2004JD005208>

The Aerosol Characterization Experiment-Asia (ACE-Asia) was conducted in March-May 2001 in the western North Pacific in order to characterize the complex mix of dust, smoke, urban/industrial pollution, and background marine aerosol that



is observed in that region in springtime. The Moderate Resolution Imaging Spectroradiometer (MODIS) provides a large-scale regional view of the aerosol during the ACE-Asia time period. Focusing only on aerosol retrievals over ocean, MODIS data show latitudinal and longitudinal variation in the aerosol characteristics. Typically, aerosol optical depth ( $\tau_{0.55}$ ) values at 0.55 micrometers are highest in the 30 deg. - 50 deg. latitude band associated with dust outbreaks. Monthly mean  $\tau_{0.55}$  in this band ranges approx. 0.40-70, although large differences between monthly mean and median values indicate the periodic nature of these dust outbreaks. The size parameters, fine mode fraction ( $\eta$ ), and effective radius ( $r_{\text{eff}}$ ) vary between monthly mean values of  $\eta = 0.47$  and  $r_{\text{eff}} = 0.75$  micrometers in the cleanest regions far offshore to approximately  $\eta = 0.85$  and  $r_{\text{eff}} = 0.30$  micrometers in near-shore regions dominated by biomass burning smoke. The collocated MODIS retrievals with airborne, ship-based, and ground-based radiometers measurements suggest that MODIS retrievals of spectral optical depth fall well within expected error ( $\Delta \tau_{0.55} = \pm 0.03 \pm 0.05 \tau_{0.55}$ ) except in situations dominated by dust, in which cases MODIS overestimate both the aerosol loading and the aerosol spectral dependence. Such behavior is consistent with issues related to particle nonsphericity. Comparisons of MODIS-derived  $r_{\text{eff}}$  with AERONET retrievals at the few occurrences of collocations show MODIS systematically underestimates particle size by 0.2 micrometers. Multiple-year analysis of MODIS aerosol size parameters suggests systematic differences between the year 2001 and the years 2000 and 2002, which are traced to instrumental electronic cross talk. Sensitivity studies show that such calibration errors are negligible in  $\tau_{0.55}$  retrievals but are more pronounced in size parameter retrievals, especially for dust and sea salt.

Author

*Aerosols; Asia; Characterization; MODIS (Radiometry); Oceans*

**2008002892** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Impact of MODIS High-Resolution Sea-Surface Temperatures on WRF Forecasts at NWS Miami, FL**

Case, Jonathan L.; LaCasse, Katherine M.; Dembek, Scott R.; Santos, Pablo; Lapenta, William M.; October 13, 2007; 1 pp.; In English; 32nd National Weather Association Annual Meeting, 13-18 Oct. 2007, Reno, NV, USA; Copyright; Avail.:

Other Sources; Abstract Only

Over the past few years, studies at the Short-term Prediction Research and Transition (SPoRT) Center have suggested that the use of Moderate Resolution Imaging Spectroradiometer (MODIS) composite sea-surface temperature (SST) products in regional weather forecast models can have a significant positive impact on short-term numerical weather prediction in coastal regions. The recent paper by LaCasse et al. (2007, Monthly Weather Review) highlights lower atmospheric differences in regional numerical simulations over the Florida offshore waters using 2-km SST composites derived from the MODIS instrument aboard the polar-orbiting Aqua and Terra Earth Observing System satellites. To help quantify the value of this impact on NWS Weather Forecast Offices (WFOs), the SPoRT Center and the NWS WFO at Miami, FL (MIA) are collaborating on a project to investigate the impact of using the high-resolution MODIS SST fields within the Weather Research and Forecasting (WRF) prediction system. The scientific hypothesis being tested is: More accurate specification of the lower-boundary forcing within WRF will result in improved land/sea fluxes and hence, more accurate evolution of coastal mesoscale circulations and the associated sensible weather elements. The NWS MIA is currently running the WRF system in real-time to support daily forecast operations, using the National Centers for Environmental Prediction Nonhydrostatic Mesoscale Model dynamical core within the NWS Science and Training Resource Center's Environmental Modeling System (EMS) software; The EMS is a standalone modeling system capable of downloading the necessary daily datasets, and initializing, running and displaying WRF forecasts in the NWS Advanced Weather Interactive Processing System (AWIPS) with little intervention required by forecasters. Twenty-seven hour forecasts are run daily with start times of 0300, 0900, 1500, and 2100 UTC on a domain with 4-km grid spacing covering the southern half of Florida and the far western portions of the Bahamas, the Florida Keys, the Straights of Florida, and adjacent waters of the Gulf of Mexico and Atlantic Ocean. Each model run is initialized using the Local Analysis and Prediction System (LAPS) analyses available in AWIPS, invoking the diabatic 'hot-start' capability. In this WRF model 'hot-start', the LAPS-analyzed cloud and precipitation features are converted into model microphysics fields with enhanced vertical velocity profiles, effectively reducing the model spin-up time required to predict precipitation systems. The SSTs are initialized with the NCEP Real-Time Global (RTG) analyses at 1/12 degree resolution (approx. 9 km); however, the RTG product does not exhibit fine-scale details consistent with its grid resolution. SPoRT is conducting parallel WRF EMS runs identical to the operational runs at NWS MIA in every respect except for the use of MODIS SST composites in place of the RTG product as the initial and boundary conditions over water. The MODIS SST composites for initializing the SPoRT WRF runs are generated on a 2-km grid four times daily at 0400, 0700, 1600, and 1900 UTC, based on the times of the overhead passes of the Aqua and Terra satellites. The incorporation of the MODIS SST composites into the SPoRTWRF runs is staggered such that the 0400UTC composite initializes the 0900 UTC WRF, the 0700 UTC composite initializes the 1500 UTC WRF, the 1600 UTC composite initializes the 2100 UTC WRF, and

the 1900 UTC composite initializes the 0300 UTC WRF. A comparison of the SPoRT and Miami forecasts is underway in 2007, and includes quantitative verification of near-surface temperature, dewpoint, and wind forecasts at surface observation locations. In addition, particular days of interest are being analyzed to determine the impact of the MODIS SST data on the development and evolution of predicted sea/land-breeze circulations, clouds, and precipitation. This paper will present verification results comparing the NWS MIA forecasts the SPoRT experimental WRF forecasts, and highlight any substantial differences noted in the predicted mesoscale phenomena.

Author

*High Resolution; MODIS (Radiometry); Sea Surface Temperature; Numerical Weather Forecasting; Mathematical Models; Mesoscale Phenomena*

### **20080012166**

#### **MISR Level 2 Surface parameters V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASLS\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASLS_V1)

The Land Surface data include bihemispherical and directional-hemispherical reflectances (albedo), hemispherical directional and bidirectional reflectance factors (BRF), BRF model parameters, leaf-area index (LAI), fraction of photosynthetically active radiation (FPAR), and normalized difference vegetation index (NDVI) on a 1.1 km grid. The land surface data include hemispherical directional reflectance factor, bihemispherical reflectance (i.e., albedo), bidirectional reflectance factor, directional hemispherical reflectance, BRF model parameters, FPAR, and terrain-referenced view and illumination angles. [Location=GLOBAL LAND] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km - 17.6 km; Longitude\_Resolution=1.1 km - 17.6 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing; Atmospheric Radiation; Reflectance; Biosphere; Vegetation; Plant Physiology; Plants (Botany); Canopies (Vegetation); Photosynthetically Active Radiation; Earth Surface; Land Use*

### **20080012181**

#### **MISR Level 2 Surface parameters V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASLS\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASLS_V2)

The Land Surface data include bihemispherical and directional-hemispherical reflectances (albedo), hemispherical directional and bidirectional reflectance factors (BRF), BRF model parameters, leaf-area index (LAI), fraction of photosynthetically active radiation (FPAR), and normalized difference vegetation index (NDVI) on a 1.1 km grid. The land surface data include hemispherical directional reflectance factor, bihemispherical reflectance (i.e., albedo), bidirectional reflectance factor, directional hemispherical reflectance, BRF model parameters, FPAR, and terrain-referenced view and illumination angles. [Location=GLOBAL LAND] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km - 17.6 km; Longitude\_Resolution=1.1 km - 17.6 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly, Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Atmospheric Radiation; Reflectance; Biosphere; Vegetation; Plant Physiology; Plants (Botany); Canopies (Vegetation); Photosynthetically Active Radiation; Earth Surface; Land Use*

### 20080012190

#### **International Satellite Cloud Climatology Project (ISCCP) Stage DX Pixel Level Cloud Product - Revised Algorithm in Native (NAT) Format**

[Data Set]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_DX\\_NAT](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_DX_NAT)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=TROPOSPHERE] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=30 Km; Longitude\_Resolution=30 Km; Temporal\_Resolution=3 Hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Satellite Imagery; Atmospheric Sounding; Radiometers; Atmospheric Radiation; Satellite Sounding; TIROS N Series Satellites; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES Satellites; GOES 5; GOES 6; GOES 7; GOES 8; Albedo; Earth Surface; Clouds (Meteorology); Cloud Cover; Atmospheric Pressure; Atmospheric Temperature; Atmospheric Moisture; Optical Thickness; Drop Size; Infrared Radiation; Infrared Spectra; Radiance; Surface Properties; Thermodynamic Properties; Visible Spectrum*

### 20080012191

#### **International Satellite Cloud Climatology Project (ISCCP) Stage D1 3-Hourly Cloud Product - Revised Algorithm in Hierarchical Data Format**

[Data Set]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_D1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_D1)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=TROPOSPHERE] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=280 Km; Longitude\_Resolution=280 Km; Temporal\_Resolution=3 Hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Satellite Imagery; Atmospheric Sounding; Radiometers; Atmospheric Radiation; Satellite Sounding; TIROS N Series Satellites; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES Satellites; GOES 5; GOES 6; GOES 7; GOES 8; GOES 9; Atmospheric Temperature; Meteorological Parameters; Atmospheric Pressure; Pressure Measurement; Atmospheric Boundary Layer; Clouds (Meteorology); Cloud Cover; Atmospheric Moisture; Optical Thickness; Water Vapor; Vertical Distribution; Atmospheric Chemistry; Ozone; Sensors; Infrared Spectra*

### 20080012192

#### **International Satellite Cloud Climatology Project (ISCCP) Stage D2 Monthly Cloud Product - Revised Algorithm in Hierarchical Data Format**

[Data Set]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_D2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_D2)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the

analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=TROPOSPHERE] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=280 Km; Longitude\_Resolution=280 Km; Temporal\_Resolution=Monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Satellite Imagery; Atmospheric Sounding; Radiometers; Atmospheric Radiation; Satellite Sounding; TIROS N Series Satellites; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES Satellites; GOES 5; GOES 6; GOES 7; GOES 8; GOES 9; Atmospheric Temperature; Meteorological Parameters; Atmospheric Pressure; Pressure Measurement; Clouds (Meteorology); Cloud Cover; Optical Thickness; Water Vapor; Atmospheric Moisture; Vertical Distribution; Atmospheric Chemistry; Ozone; Sensors; Infrared Spectra; Visible Spectrum*

### 20080012193

#### **International Satellite Cloud Climatology Project (ISCCP) Stage B3 Reduced Radiances in Native (NAT) Format (ISCCP\_B3\_NAT)**

[Data Set]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_B3\\_NAT](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_B3_NAT)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=TROPOSPHERE] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=30 Km; Longitude\_Resolution=30 Km; Temporal\_Resolution=3 Hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Satellite Imagery; Atmospheric Sounding; Radiometers; Atmospheric Radiation; Satellite Sounding; TIROS N Series Satellites; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES Satellites; GOES 5; GOES 6; GOES 7; GOES 8; GOES 9; Drop Size; Clouds (Meteorology); Atmospheric Pressure; Optical Thickness; Atmospheric Temperature; Cloud Cover; Infrared Radiation; Infrared Spectra; Radiance; Visible Spectrum*

### 20080012196

#### **International Satellite Cloud Climatology Project (ISCCP) Stage D2 Monthly Cloud Product - Revised Algorithm in Native (NAT) Data Format**

[Data Set]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_D2\\_NAT](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_D2_NAT)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=TROPOSPHERE] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=280 Km; Longitude\_Resolution=280 Km; Temporal\_Resolution=Monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Satellite Imagery; Atmospheric Sounding; Radiometers; Atmospheric Radiation; Satellite Sounding; TIROS N Series Satellites; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES Satellites; GOES 5; GOES 6; GOES 7; GOES 8; GOES 9; Atmospheric Temperature; Meteorological Parameters; Atmospheric Pressure; Pressure Measurement; Clouds (Meteorology); Cloud Cover; Optical Thickness; Water Vapor; Atmospheric Moisture; Vertical Distribution; Atmospheric Chemistry; Ozone; Sensors; Infrared Spectra; Visible Spectrum*

**20080012197**

**International Satellite Cloud Climatology Project (ISCCP) Stage D1 3-Hourly Cloud Product - Revised Algorithm in Native (NAT) Format**

[Data Set]

Rosow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_D1\\_NAT](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_D1_NAT)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=TROPOSPHERE] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=280 Km; Longitude\_Resolution=280 Km; Temporal\_Resolution=3 Hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Satellite Imagery; Atmospheric Sounding; Radiometers; Atmospheric Radiation; Satellite Sounding; TIROS N Series Satellites; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES Satellites; GOES 5; GOES 6; GOES 7; GOES 8; GOES 9; Atmospheric Temperature; Meteorological Parameters; Atmospheric Pressure; Pressure Measurement; Atmospheric Boundary Layer; Clouds (Meteorology); Cloud Cover; Atmospheric Moisture; Optical Thickness; Water Vapor; Vertical Distribution; Atmospheric Chemistry; Ozone; Sensors; Infrared Spectra*

**44**

**ENERGY PRODUCTION AND CONVERSION**

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels*.

**20080000428** Naval Research Lab., Washington, DC USA

**Survey of Commercial Small Lithium Polymer Batteries**

Stux, Arnold M; Swider-Lyons, Karen; Sep 19, 2007; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472272; NRL/MR/6110--07-9073; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472272>

The power and energy of small 1 to 5 g lithium polymer batteries is improving significantly, with a push from the toy and hobby markets. This report characterizes the power and energy of several small batteries from Atomic Workshop, Full River, Kokam, and TOBN, presenting discharge curves as a function of C-rates. The 130 mAh Atomic Workshop batteries are rated to a specific power of nearly 2400 W/kg, and energies on the order of 140 to 160 Wh/kg. The Full River lithium polymer batteries also have high power and energy. The battery chemistry is the standard lithium cobalt oxide vs. carbon, so the high power is attributed to improvements in manufacturing.

DTIC

*Lithium Batteries; Surveys*

**20080001211** Army Tank-Automotive Research and Development Command, Warren, MI USA

**TARDEC Battery Efforts**

Gargies, Sonya; Tomkiw, Marta; Aug 8, 2007; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472958; TARDEC-17521; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Briefing on battery research being done at TARDEC.

DTIC

*Electric Batteries; Lithium; Lithium Batteries; Metal Ions*

**20080001254** March Scientific Ltd., Dunrobin, Ontario Canada

**Expert Assessment of Advanced Power Sources**

Gardner, Christopher L; Jul 2007; 69 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7714-05-0915

Report No.(s): AD-A473044; DRDC-CR-2007-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although DRDC published an exhaustive technical report (in August 2001) on technology trends in advanced power sources projected out to the year 2020, the terrorist attacks on the US on September 11, 2001 (and the consequent, augmented and more broadly-based defence and national security posture adopted by the CF/DND), together with rapid developments in power source technologies over the past five years, internationally, prompted DRDC to update the 2001 report, on a selected number of power source technologies or applications and to provide further guidance to DRDC's Advanced Power Source R&D program. Eight wide-ranging, power source technologies or applications were investigated, using the technique of 'expert elicitation' (that is, using independent experts in the various and diverse technological fields), based on a standardized questionnaire, augmented by the contractor's own expertise (and his overall analysis of the experts' responses) in these diverse areas. In addition, each expert was asked about his/her view on the likely role of nanotechnology in each technological area or application. Following collection and analysis of all the data, the contractor made recommendations on the ability of each power source to meet the future requirements of the CF/DND, taking into account the Technology Readiness Level, for each technology or application.

DTIC

*Fuel Cells; Supplying*

**20080001695** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Textile Capacitor Patent: AFRL Earns Patent for an Airframe Integrated Energy Storage Technology Concept (Preprint)**

Baron, William G; Withrow, Melissa; Mar 2006; 7 pp.; In English

Contract(s)/Grant(s): Proj-A01G

Report No.(s): AD-A473206; AFRL-RB-WP-TP-2007-322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473206>

Three AFRL scientists, William Baron, Dr. Maxwell Blair, and Sandra Fries-Carr recently received a patent entitled 'Airframe Structure-Integrated Capacitor.' Structural capacitor implies that in addition to carrying load, the aircraft or spacecraft structure maintains capacitive charge for energy storage and power conditioning used in a variety of applications, both pulsed and continuous. The specific objectives of this effort are identifying a plausible design concept, conducting experimental trials, and characterizing the concept structural and electrical efficiency. The concept is based on a dielectric-coated conductor with a conductive metal outerlayer, then integrate the coaxial system into a hybridized, composite weave with carbon tow for additional reinforcement.

DTIC

*Airframes; Capacitors; Energy Storage; Patents; Textiles*

**20080002255** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Power and Energy Strategy**

Hitchcock, Jennifer; Aug 3, 2007; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473088; RDECOM/TARDEC-17518; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473088>

This briefing covers power sources in the 1 KW thru 1 MW range, a common range for vehicles and mobile generators. The objectives of the division are to develop an integrated strategy to meet the power and energy requirements of current and future modular force.

DTIC

*Supplying; Military Vehicles; Power Supplies; Research Management*

**20080002543** Army Tank-Automotive and Armaments Command, Warren, MI USA

**General Performance Specification for the Common Modular Power System**

Oct 29, 2007; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473685; USATACOM-18440; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This specification establishes basic system-level performance requirements for the Common Modular Power System

(CMPS). This specification is intended to be used in conjunction with a vehicle specific performance specification to define the requirements of the CMPS as applied to the PEO GCS platforms. This specification is to be used to write the specific CMPS vehicle specification, choosing the requirements from this specification that would be applicable to the specific vehicle integration.

DTIC

*Electric Power Transmission; Functional Design Specifications; Specifications*

**20080002615** Library of Congress, Washington, DC USA

**The European Union's Energy Security Challenges**

Belkin, Paul; Morelli, Vince L; Jan 26, 2007; 34 pp.; In English

Report No.(s): AD-A473788; CRS-RL33636; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent increases in energy prices and a steady escalation in global energy demand expected to rise by nearly 60% over the next 20 years have led U.S. policy-makers to engage in a wide ranging debate over how best to address the country's future energy requirements. Similarly, energy security has become a policy priority for the European Union (EU) and its 27 member states. Together, the USA and Europe represent the world's largest energy market. Although they produce approximately 23% of the world's energy, they consume almost 40% of the world's supply. The member states of the EU account for approximately 18% of global oil consumption and consume 19% of gas produced. Today, the EU imports about 50% of its energy needs. Barring significant changes, the European Commission (Commission) expects this figure to rise to 65% by 2030. Approximately half of the EU's imported energy in the form of oil and natural gas comes from Russia. Europe's growing dependence on Russian energy has fueled speculation that Moscow will use the energy weapon to try to influence future foreign or economic policy in Europe.

DTIC

*Security*

**20080002815** Nanyang Technological Univ., Nanyang, Singapore

**Advanced Microbial Fuel Cell Development, Miniaturization and Energy and Power Density Enhancement**

Li, Chang M; Apr 30, 2007; 39 pp.; In English

Contract(s)/Grant(s): FA520905P0505; AOARD-05-4073

Report No.(s): AD-A473732; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report covers investigations of advanced microbial H<sub>2</sub>/O<sub>2</sub>-fuel cell development, miniaturization, and energy and power density enhancement. The anode is very important in the performance of a microbial fuel cell 'MFC', and is often the limiting factor for a high power output. In present work, we used the CNT/PANI composite as the anode materials of MFCs for the first time and investigated the electrocatalytic properties of the composite associated with the bacterium biocatalyst. A method was developed to fabricate a nanostructured CNT/PANI composite anode for MFCs.

DTIC

*Augmentation; Flux Density; Fuel Cells; Microorganisms; Miniaturization*

45

**ENVIRONMENT POLLUTION**

Includes atmospheric, water, soil, noise, and thermal pollution.

**20080000860** NASA Glenn Research Center, Cleveland, OH, USA

**Potential Carbon Negative Commercial Aviation through Land Management**

Hendricks, Robert C.; [2007]; 7 pp.; In English; 12th International Symposium on Transport Phenomena and Dynamics of Rotating Machinery, 17-22 Feb. 2008, Honolulu, HI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.16.03

Report No.(s): ISROMAC12-2008-20242; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000860>

Brazilian terra preta soil and char-enhanced soil agricultural systems have demonstrated both enhanced plant biomass and crop yield and functions as a carbon sink. Similar carbon sinking has been demonstrated for both glycophyte and halophyte plants and plant roots. Within the assumption of 3.7 t-C/ha/yr soils and plant root carbon sinking, it is possible to provide carbon neutral U.S. commercial aviation using about 8.5% of U.S. arable lands. The total airline CO<sub>2</sub> release would be offset by carbon credits for properly managed soils and plant rooting, becoming carbon neutral for carbon sequestered synjet

processing. If these lands were also used to produce biomass fuel crops such as soybeans at an increased yield of 60 bu/acre (225gal/ha), they would provide over 3.15 10(exp 9) gallons biodiesel fuel. If all this fuel were refined into biojet it would provide a 16% biojet-84% synjet blend. This allows the U.S. aviation industry to become carbon negative (carbon negative commercial aviation through carbon credits). Arid land recovery could yield even greater benefits.

Author

*Biomass; Plant Roots; Soils; Farm Crops; Carbon Dioxide; Land Management*

**2008000897** Ching Yun Univ., Chung-Li, Taiwan, Province of China

**High Resistivities Associated with a Newly Formed LNAPL Plume Imaged by Geoelectric Techniques - A Case Study**  
Yang, Chieh-Hou; Yu, Chun-Yi; Su, Shan-Wen; Journal of the Chinese Institute of Engineers: Vol. 30, No. 1; January 2007, pp. 53-62; In English; See also [2008000896](#); Copyright; Avail.: Other Sources

In April 10, 1997, a rice field in Nankan county, northwestern Taiwan was flooded by sixty to seventy kilolitres of fuel oil as a result of an accidental underground pipeline leakage. Immediate action to excavate contaminated soil and remove it to a landfill were done. However, it was believed that a significant quantity of light non-aqueous phase liquid (LNAPL) contaminant might have remained in the soil and infiltrated into the groundwater. This paper emphasizes the use of multiple geoelectric techniques to detect and map the LNAPL plume in this uncontrolled real-world site, and help monitor the effectiveness of the clean-up operation. A significant change in resistivity values was detected between polluted (> 140 ohm-m) and non-polluted areas (< 140 ohm-m). Repeated measurements were conducted at 1, 4 and 10 month intervals after the first measurements. These data were used to monitor variation and a possible spreading of the LNAPL plume over time. The total LNAPL masses were concentrated or diluted in the soil matching the variations of the water table. Two additional resistivity profiles were conducted to investigate the spatial distribution of the LNAPL contaminant plume within the study area. Electromagnetic induction and ground penetrating radar were also used to outline the resistivity zone defined by the plumes. The results of the survey serve to provide insight into the sensitivity of geoelectrical methods for detecting a shallow subsurface LNAPL plume, and help to provide valuable information related to monitoring the movement of an LNAPL plume over time in a study area.

Author

*Contaminants; Electrical Resistivity; Plumes; Water Pollution; Environmental Chemistry; Pollution Transport; Soil Pollution*

**2008001215** Defence Research and Development Canada, Toronto, Ontario Canada

**Water Collection Purification System: Identifying CF Capabilities and Requirements, and Assessing off-the-Shelf Purification Systems**

Quemerais, Bernadette; Aug 2006; 36 pp.; In English

Contract(s)/Grant(s): 12CY03

Report No.(s): AD-A472969; DRDC TORONTO-TR2006-125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Water Collection Purification System project is part of the Shelter and Survival Equipment project (12cy) sponsored by DLR. The objective is to provide to the military a water purification system suitable for all operational/environmental conditions. The capabilities of the CF in terms of both purification and testing have been assessed. Users of the current system as well as PMed technicians have been contacted in order to discuss both the capabilities and the requirements. An assessment based on manufacturer specifications of the off-the-shelf purification systems has been done. The identification of commercial system capabilities and their validation will be done during the next two years.

DTIC

*Identifying; Purification; Supplying; Water; Water Treatment*

**2008001231** Defence Research and Development Canada, Toronto, Ontario Canada

**A Baseline Air Quality Assessment Onboard a Victoria Class Submarine: HMCS Windsor**

Severs, Y D; May 2006; 59 pp.; In English; In English; Original contains color illustrations

Report No.(s): AD-A473000; DRDC-TR-2006-087; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In 1998, as part of the management plan for the purchase of the Royal Navy (RN) Upholder Class Submarines (subsequently designated Victoria class), initiatives for submarine air quality were identified. This air quality study is a continuation of this plan; with the objective to obtain information to assist in confirming the status of the submarines and what future air quality management was necessary. This trial thus represents a baseline habitability evaluation of Canada's Victoria class submarines to confirm compliance with the current maximum permissible contaminant limits stipulated in the Air



Purification Standard, BR 1326, and how that can best be achieved. To achieve this aim the study monitored the effects of: air purification capabilities (management of Oxygen (O<sub>2</sub>) and Carbon Dioxide (CO<sub>2</sub>)); routine housekeeping procedures (cleaning and cooking); lifestyle effects (smoking); system effects (engine, compressor and motor); and the effectiveness of snorting, the resulting air exchange and the reliability of monitoring instruments. Monitoring the atmospheric conditions has shown that under normal routine operational conditions, following standard operating practices and procedures, all contaminants found in the atmosphere were within limits set in BR 1326. However, when there are unexpected contributions of contaminants, such as the intake of engine backfire emissions, combustible by-products and key aromatics (i.e., Benzene, Toluene, Ethylbenzene and Xylenes) remain within limits, but the total allowable organics limit is exceeded (40 mg/m<sup>3</sup>).

DTIC

*Air Quality; Submarines*

**20080001849** Science Applications International Corp., Tucson, AZ USA

**Environmental Assessment for Proposed Replacement of the Squadron Operations Facility at the 140th Wing, Colorado Air National Guard**

Meyer, Elizabeth; Bartz, Kate; Jallo, Carlos; Sheva, Elise; Lindquist, Jeff; Sep 2007; 146 pp.; In English

Report No.(s): AD-A473273; XC-460SPW; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The 140th Wing (140 WG) of the Colorado Air National Guard (ANG) proposes to construct and operate an adequately sized, technologically up-to-date, and properly configured Squadron Operations Facility at Buckley Air Force Base (AFB) to accommodate the requirements of the Air Sovereignty Alert (ASA) and North American Aerospace Defense Command (NORAD) missions. The Proposed Action would provide a new Squadron Operation Facility as well as interior modifications to the existing Squadron Operations Facility (Building 700) to provide an adequate facility for the 140 Security Forces. Alternatives to the Proposed Action include two alternative site locations for the Squadron Operations Facility. This Environmental Assessment (EA) evaluates the potential environmental impacts from implementing the Proposed Action and alternatives. The EA has been prepared in accordance with the National Environmental Policy Act to analyze the potential environmental consequences of the Proposed Action and alternatives. Under the No Action Alternative, no construction, modification, relocation, demolition, or operation of elements of the Proposed Action would occur. The environmental resources evaluated for the Proposed Action include land use, socioeconomics, air quality, noise, earth resources, water resources, biological resources, solid and hazardous materials and waste, utilities, environmental justice, and cultural resources.

DTIC

*Armed Forces (United States); Military Air Facilities; Replacing; Wings*

**20080001897** Native Energy and Technologies, Inc., New Braunfels, TX USA

**Environmental Assessment for Proposed Construction Freight Transfer Facility, Buckley Air Force Base, Colorado**

Meyer, Elizabeth; Merrill, Mark; Zapalac, Debbie; Sherva, Elise; Lindquist, Jeff; Jun 2007; 130 pp.; In English

Report No.(s): AD-A473344; XC-460SPW; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Under the Proposed Action, Air Force Element Program Resource Office (AFE PRO) and Defense Courier Service (DCS) is proposing to construct and operate a Freight Transfer Facility at Buckley AFB. This proposed 12,000 square foot (ft<sup>2</sup>) facility, associated parking, utilities, and security will accommodate the mission beddown of AFE PRO & DCS on Buckley AFB. The proposed facility will be sited adjacent to taxiway H, north of taxiway D. Construction is currently planned for 2007.

DTIC

*Cargo; Construction; Environmental Surveys; Military Air Facilities*

**20080002160** Texas Univ., San Antonio, TX USA

**Radiation Biomarker Research Using Mass Spectrometry**

Bach, Stephan B; Hubert, Walter; Jul 2007; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-05-1-6642; BAA05-06-HE; Proj-7757

Report No.(s): AD-A473187; UTSA0001Z; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using mass spectrometry to investigate biomarkers from radiation exposure is fairly new. The implementation of mass spectrometric techniques to systems of biological interest has only recently taken off. Therefore, there have only been a limited number of applications of mass spectrometry in radiation dosimetry research. This review is intended to give an overview of mass spectrometry and its application to biological systems and biomarker discovery and how that might relate to relevant radiation dosimetry studies and how these two areas might be combined to benefit both areas of research. Efficient proteomics

analyses have necessitated the use of various methods of mass spectrometry in recent years; especially concerning biomarker detection and characterization. A brief summary of the research thus far conducted follows.

DTIC

*Biomarkers; Mass Spectroscopy*

### **20080012167**

#### **MISR Level 2 Aerosol parameters V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASAE\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASAE_V1)

The Aerosol data contain aerosol optical depth, aerosol physical model, ancillary meteorological data, and related parameters. The aerosol data include tropospheric aerosol optical depth, Angstrom exponent and single scattering albedo on 17.6 km centers, aerosol mixture identifier and retrieval residuals, and ancillary data including assumed ozone optical depth and retrieval flags. For complete information about the aerosol mixtures, the user will need to order the MISR Aerosol Climatology Product (MIANACP) to obtain Aerosol Physical and Optical Properties (APOP) and the Mixture files. The Mixture files list up to 3 component models used in each mixture, with their relative compositional fractions, and includes ancillary information such as single scattering albedo. The APOP gives detailed information for the component particle models. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km - 17.6 km; Longitude\_Resolution=1.1 km - 17.6 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing; Aerosols; Particulates; Extinction; Air Quality; Turbidity*

### **20080012180**

#### **MISR Level 2 Aerosol parameters V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASAE\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2ASAE_V2)

The Aerosol data contain aerosol optical depth, aerosol physical model, ancillary meteorological data, and related parameters. The aerosol data include tropospheric aerosol optical depth, Angstrom exponent and single scattering albedo on 17.6 km centers, aerosol mixture identifier and retrieval residuals, and ancillary data including assumed ozone optical depth and retrieval flags. For complete information about the aerosol mixtures, the user will need to order the MISR Aerosol Climatology Product (MIANACP) to obtain Aerosol Physical and Optical Properties (APOP) and the Mixture files. The Mixture files list up to 3 component models used in each mixture, with their relative compositional fractions, and includes ancillary information such as single scattering albedo. The APOP gives detailed information for the component particle models. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km - 17.6 km; Longitude\_Resolution=1.1 km - 17.6 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly, Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Aerosols; Particulates; Extinction; Air Quality; Turbidity*

## GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

**20080000349** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

**Combinations of Earth Orientation Measurements: SPACE2006, COMB2006, and POLE2006**

Gross, Richard S.; July 2007; 27 pp.; In English

Contract(s)/Grant(s): NAS7-03001

Report No.(s): JPL-Publ- 07-5; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000349>; <http://hdl.handle.net/2014/40411>

Independent Earth orientation measurements taken by the space-geodetic techniques of lunar and satellite laser ranging, very long baseline interferometry, and the Global Positioning System have been combined using a Kalman filter. The resulting combined Earth orientation series, SPACE2006, consists of values and uncertainties for Universal Time, polar motion, and their rates that span from September 28, 1976, to February 10, 2007, at daily intervals and is available in versions whose epochs are given at either midnight or noon. The space-geodetic measurements used to generate SPACE2006 have then been combined with optical astrometric measurements to form two additional combined Earth orientation series: (1) COMB2006, consisting of values and uncertainties for Universal Time, polar motion, and their rates that span from January 20, 1962, to February 10, 2007, at daily intervals and which is also available in versions whose epochs are given at either midnight or noon; and (2) POLE2006, consisting of values and uncertainties for polar motion and its rate that span from January 20, 1900, to January 21, 2007, at 30.4375-day intervals.

Author

*Geodetic Surveys; Earth Orientation; Universal Time; Optical Measurement; Global Positioning System; Astrometry*

**20080000416** Stanford Univ., Stanford, CA USA

**Controlled Precipitation of Radiation Belt Particles**

Inan, Umran S; Bell, Timothy F; Chevalier, Timothy W; Aug 23, 2007; 6 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0519

Report No.(s): AD-A472252; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472252>

The Air Force Grant documented here directly resulted in the purchase of hardware eight VLF receivers. Five of these receivers have been deployed successfully and are operating regularly and reliably. The remaining are pending imminent deployment. The new receiver sites have enabled Stanford to jumpstart a fully-funded THY program, with funds from Stanford University and NASA, which will enable a great expansion of this network, and in addition, provides a new dataset which will greatly support Stanford's scientific studies of VLF and magnetospheric and ionospheric physics.

DTIC

*Radiation Belts; Receivers; Very Low Frequencies*

**20080000433** Wisconsin Univ., Madison, WI USA

**High-Resolution Seismic Velocity and Attenuation Structure of the Sichuan-Yunnan Region, Southwest China, Using Seismic Catalog and Waveform Data**

Zhang, Haijiang; Liu, Yunfeng; Thurber, Clifford H; Xu, Zhen; Song, Xiaodong; Jul 13, 2007; 62 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-05-C-0016; Proj-1010

Report No.(s): AD-A472285; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472285>

The Sichuan-Yunnan region in southwestern China lies in the transition zone between the uplifted Tibetan plateau to the west and the Yangtze continental platform to the east. This region has a very complicated geological structure and is one of the most active areas of continental earthquakes in the world. This two-year project is to develop high-resolution models of the velocity and attenuation structure of the Sichuan-Yunnan region (longitudes ~97-108 degrees E and latitudes ~21-35 degrees N) using seismic catalog and waveform data. There are four main components in this project: (1) using waveform alignment methods (waveform cross-correlation and bispectrum analysis) to obtain more accurate differential arrival times, (2) using regional scale adaptive-grid double-difference tomography to obtain detailed P- and S-wave velocity models of the Sichuan-Yunnan region, (3) using the adaptive-grid triple-difference seismic attenuation method to determine the detailed

attenuation structure for both Qp and Qs for the Yunnan region, and (4) assembling a ground truth database.  
DTIC

*Attenuation; Catalogs (Publications); Characterization; China; High Resolution; Waveforms*

**2008000997** Boston Coll., Chestnut Hill, MA USA

**Estimates of Atmospheric Distortion Number for Nonlinear Refraction**

Roadcap, J R; McNicholl, P J; Beland, R R; Jumper, G Y; Jan 2007; 14 pp.; In English

Contract(s)/Grant(s): FA8718-05-C-0085; Proj-1010

Report No.(s): AD-A472624; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472624>

A characteristic nondimensional distortion number  $N_d$  was derived in the 1970s that allows inference of the degree of nonlinear refraction or thermal blooming associated with an atmospheric laser path. For a continuous-wave (CW) laser with a Gaussian-shaped beam, the distortion number is a function of several variables including laser power and aperture size, optical wavelength, atmospheric absorption and extinction, index of refraction, temperature, air density, and the air speed or flow transverse to the laser beam. Scenario-dependent calculations of atmospheric distortion number  $N_d$  are developed for different geographic regions and seasons using the Air Force Research Laboratory's global thermosonde database, the HITRAN molecular spectroscopic database, and global climatological aerosol model extinction profiles. Tactical air-to-ground scenarios are described as a function of altitude, target distance, and laser-to-target azimuth angle for the COIL wavelength (1.315 micrometers). The results are interpreted in light of seasonal and geographical factors as well as path-integrated moisture.

DTIC

*Atmospheric Refraction; Distortion; Estimates; Nonlinear Systems; Nonlinearity; Refraction*

**2008001047** Naval Research Lab., Stennis Space Center, MS USA

**Embedment of the Sediment Layer Electrode Deployer (SLED): Results from 2006 Tests at Stennis Space Center**

Quaid, Andrew J; Book, Jeffrey W; Hulbert, Mark S; Sep 21, 2007; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472733; NRL/MR/7330--07-9060; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472733>

In 2006, five field tests were made at Stennis Space Center of a Sediment Layer Electrode Deployer (SLED). The objective was to submerge an array of vertical-plate electrodes, with a total surface area of 18,580 cm squared into anoxic sediment layers by a method that may be accomplished from research vessels. The embedded electrodes would allow power generation from the Benthic Unattended Generator (BUG) technique. Towed-deployment and vibration-deployment techniques were investigated. The best results were incomplete embedment depths ranging from 17.8 cm to 30.5 cm. Problems for towed tests included an imbalance of forces between the front and rear sections of the SLED, and a catastrophic material failure during embedment with anchor flukes. Uneven embedment during vibration-deployment may have resulted from obstacles in the sediment, a sloping bottom effect, or greater resistance to vibration as the SLED embeds. Further research and development is necessary to find an effective embedment technique.

DTIC

*Deployment; Electrodes; Sediments*

**2008001458** NASA Langley Research Center, Hampton, VA, USA

**The Impact of Interannual Variability on Multi-Decadal Total Ozone Simulations**

Fleming, Eric L.; Jackman, Charles H.; Weisenstein, Debra K.; Ko, Malcolm K. W.; [2007]; 18 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 109431.07.01; Copyright; Avail.: Other Sources

We have used a two-dimensional (2D) chemistry and transport model to study the effects of interannual dynamical variability on total ozone simulations on a global basis for 1979-2004. Long term meteorological data from the National Centers for Environmental Prediction-National Center for Atmospheric Research (NCEP-NCAR) reanalysis-2 project, and the European Center for Medium Range Weather Forecasts (ECMWF) updated reanalyses (ERA-40) are utilized to construct the yearly transport and temperature fields for use in the 2D model. We performed a series of model experiments to examine the relative roles of the interannual variability, changes in volcanic aerosol loading, the 11-year solar cycle in ultraviolet flux, and increases in stratospheric halogen loading associated with industrially produced chlorofluorocarbons in controlling

multi-decadal total ozone changes. These model results illustrate the large impact of interannual variability which can dominate over the other factors in driving the year-to-year total ozone changes. Statistical regression time series analysis is then used to isolate signals associated with the quasi-biennial oscillation (QBO), the solar cycle, the El Chichon and Mt. Pinatubo volcanic eruptions, and the seasonal cycles. The model qualitatively simulates much of the seasonal and interannual variability observed in long term satellite-based total ozone data in the tropics and extratropics, including fluctuations related to the QBO. We also found that at Northern midlatitudes, the simulated interannual dynamical variability acts to reinforce the chemical ozone depletion caused by the enhanced aerosol loading following the Pinatubo eruption. However at Southern midlatitudes, the interannual variability masks the aerosol-induced chemical effect. Model results also show that the simulated solar cycle response in total ozone is generally consistent with the observations, and that most of this response is due to the direct photochemical effect.

Author

*Annual Variations; Ozone Depletion; Simulation; Geophysics; Two Dimensional Models*

**20080001655** Wyoming Univ., Laramie, WY USA

**Obtaining Unique, Comprehensive Deep Seismic Sounding Data Sets for CTBT Monitoring and Broad Seismological Studies**

Morozov, Igor B; Morozova, Elena A; Smithson, Scott B; Jul 2, 2007; 62 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DTRA01-01-C-0081; Proj-DTRA

Report No.(s): AD-A473124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473124>

In cooperation with the Center for Geophysical and Geoecological Studies (GEON, Moscow, Russia), the University of Wyoming and now also with the University of Saskatchewan digitized, edited, transferred into standard digital formats, and delivered to public domain seismic records from 12 major Deep Seismic Sounding (DSS) projects acquired in 1970-1980's in the former Soviet Union. The data include 3-component records from 22 Peaceful Nuclear Explosions (PNEs) and over 500 chemical explosions recorded by a grid of linear, reversed seismic profiles covering a large part of Northern Eurasia. Digital copies of all records were delivered to AFRL and to the Incorporated Research Institutions for Seismology Data Center for unrestricted distribution to researchers. The availability of the DSS PNE datasets resulting from this project, combined with the recent results arising from them (velocity, reflectivity, Receiver Functions, mantle attenuation, Lg Q, P- and Lg coda Q, scattering, phase amplitude ratios, empirical first-arrival travel times) makes the area of PNE profiling one of the best-constrained seismically at short periods, both for structural studies and for nuclear test monitoring.

DTIC

*Attenuation; Nuclear Explosions; Seismic Waves; Seismology; Sounding*

**20080001686** Weston (Roy F.), Inc., West Chester, PA USA

**Task Order 2 Enhanced Preliminary Assessment Defense Mapping Agency (DM), Herndon, Virginia**

Smith, Laurence; Blackburn, Katherine; Bove, Lawrence; Johnson, Glenn; Dec 1989; 104 pp.; In English

Contract(s)/Grant(s): DAAA15-88-D-0007

Report No.(s): AD-A473180; 2281-09-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473180>

An enhanced Preliminary Assessment was conducted at the Defense Mapping Agency (DMA) site in Herndon, Virginia which is planned for inclusion in the Base Closure Program. The facility is located on approximately 12 acres of land in northern Virginia. Initially constructed as a NIKE missile Integrated Fire Control Area, the site is now administered by the U.S. Army Corps of Engineers and permitted to DMA. At the site DMA maintains activities that support field personnel performing geodetic mapping operations. A site visit was performed on 2 October, 1989. During the survey no conditions requiring immediate action were discovered. Six environmentally significant operations (ESO's) were identified: \* Underground storage tanks \* Hazardous materials storage at both existing facilities and a paint/oil shed no longer on-site \* Asbestos-containing materials in buildings \* Transformers \* Septic filter bed \* Pesticide and herbicide use.

DTIC

*Closures; Environmental Surveys; Fire Control; Geodetic Surveys; Sampling; Systems Integration*

**20080001941** General Accounting Office, Washington, DC USA

**Climate Change Research. Agencies Have Data-Sharing Policies but Could Do More to Enhance the Availability of Data from Federally Funded Research**

Stephenson, John; Raynes, Diane; Browning, Kyle; Cardamone, Kate; Delicath, John; Garvey, Carolyn; Johnson, Richard; Musser, Lynn; Raheb, Katherine M; Sep 2007; 62 pp.; In English

Report No.(s): AD-A473424; GAO-07-1172; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Much of the nearly \$2 billion annual climate change research budget supports grants from the Department of Energy (DOE), National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), and National Science Foundation (NSF). Some of the data generated by this research are stored in online archives, but much remains in a less accessible format with individual researchers. As a result, some researchers are concerned about the availability of data. GAO analyzed (1) the key issues that data-sharing policies should address; (2) the data-sharing requirements, policies, and practices for external climate change researchers funded by DOE, NASA, NOAA, and NSF; and (3) the extent to which these agencies foster data sharing. GAO examined requirements, policies, and practices and surveyed the 64 officials managing climate change grants at these agencies. GAO recommends the agencies explore opportunities in the grants process to better ensure the availability of data to other researchers and determine if additional archiving strategies are warranted. In commenting on a draft of this report, the four agencies generally agreed with our findings and recommendations. We incorporated technical clarifications as appropriate.

DTIC

*Climate; Climate Change; Policies*

**20080002214** Bay Area Environmental Research Inst., Sonoma, CA, USA; NASA Ames Research Center, Moffett Field, CA, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Assessment of MODIS-Derived Visible and Near-IR Aerosol Optical Properties and their Spatial Variability in the Presence of Mineral Dust**

Redemann, J.; Zhang, Q.; Schmid, B.; Russell, P. B.; Livingston, J. M.; Jonsson, H.; Remer, L. A.; Geophysical Research Letters; September 30, 2006; Volume 33; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNG04GM63G; NAG5-12573; EOS/03-0584-0647; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2006GL026626>

Mineral dust aerosol is among the most difficult aerosol species to measure quantitatively from space. In this paper, we evaluate MODIS retrievals of spectral aerosol optical depth (AOD) from the visible to the near-IR off the US West Coast using measurements taken by the NASA Ames Airborne Tracking Sunphotometer, AATS-14, during the EVE (Extended-MODIS-lambda Validation Experiment, 2004) campaign in April of 2004. In EVE, a total of 35 and 49 coincident over-ocean suborbital measurements at the nominal level-2 retrieval scale of 10 km x 10 km were collected for Terra and Aqua, respectively. For MODIS-Terra about 80% of the AOD retrievals are within the estimated uncertainty, DELTA tau = plus or minus 0.03 plus or minus 0.05 tau; this is true for both the visible (here defined to include 466-855 nm) and near-IR (here defined to include 1243-2119 nm) retrievals. For MODIS-Aqua about 45% of the AOD retrievals are within DELTA tau = plus or minus 0.03 plus or minus 0.05 tau; the fraction of near-IR retrievals that fall within this uncertainty range is about 27%. We found an rms difference of 0.71 between the sunphotometer and MODIS-Aqua estimates of the visible (553-855 nm) Angstrom exponent, while the MODIS-Terra visible Angstrom exponents show an rms difference of only 0.29 when compared to AATS. The cause of the differences in performance between MODIS-Terra and MODIS-Aqua could be instrument calibration and needs to be explored further. The spatial variability of AOD between retrieval boxes as derived by MODIS is generally larger than that indicated by the sunphotometer data.

Author

*Dust; Minerals; MODIS (Radiometry); Near Infrared Radiation; Optical Properties; Variability; Aerosols; Light (Visible Radiation); Spatial Distribution*

**20080002296** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Prediction of Geomagnetic Activity and Key Parameters in High-Latitude Ionosphere-Basic Elements**

Lyatsky, W.; Khazanov, G. V.; October 2007; 44 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-11995

Report No.(s): NASA/TP-2007-215079; M-1205; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002296>

Prediction of geomagnetic activity and related events in the Earth's magnetosphere and ionosphere is an important task of the Space Weather program. Prediction reliability is dependent on the prediction method and elements included in the

prediction scheme. Two main elements are a suitable geomagnetic activity index and coupling function -- the combination of solar wind parameters providing the best correlation between upstream solar wind data and geomagnetic activity. The appropriate choice of these two elements is imperative for any reliable prediction model. The purpose of this work was to elaborate on these two elements -- the appropriate geomagnetic activity index and the coupling function -- and investigate the opportunity to improve the reliability of the prediction of geomagnetic activity and other events in the Earth's magnetosphere. The new polar magnetic index of geomagnetic activity and the new version of the coupling function lead to a significant increase in the reliability of predicting the geomagnetic activity and some key parameters, such as cross-polar cap voltage and total Joule heating in high-latitude ionosphere, which play a very important role in the development of geomagnetic and other activity in the Earth's magnetosphere, and are widely used as key input parameters in modeling magnetospheric, ionospheric, and thermospheric processes.

Author

*Data Correlation; Earth Magnetosphere; Geomagnetism; Polar Regions; Solar Wind; Space Weather; Magnetic Storms; Solar Terrestrial Interactions; Weather Forecasting; Interplanetary Magnetic Fields*

### **20080012021**

#### **CERES BiDirectional Scans (BDS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_TRMM-PFM\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_TRMM-PFM_Edition1)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2000-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### **20080012022**

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_TRMM-PFM\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_TRMM-PFM_Edition1)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV

CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=1998-08-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### **20080012023**

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_TRMM-PFM\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_TRMM-PFM_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=1998-08-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012024**

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_TRMM-PFM\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_TRMM-PFM_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-



PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1  
CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-  
FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-  
FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2  
CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-  
FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL]  
[Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=1998-08-31] [Spatial\_Coverage: Southernmost\_Latitude=-90;  
Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution:  
Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or  
approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - <  
Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave  
Radiation; Long Wave Radiation; Albedo*

### 20080012025

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_TRMM-PFM\\_Transient-Ops2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_TRMM-PFM_Transient-Ops2)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=1999-07-17] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave  
Radiation; Long Wave Radiation*

### 20080012026

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_TRMM-PFM\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_TRMM-PFM_Edition2)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-

FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2  
CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV  
CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### 20080012027

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_TRMM-PFM\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_TRMM-PFM_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012028

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_TRMM-PFM\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_TRMM-PFM_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following

CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012029

#### **CERES BiDirectional Scans (BDS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM1_Edition1)

[asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM1_Edition1)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-11-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### 20080012030

#### **CERES BiDirectional Scans (BDS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM2_Edition1)

[asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM2_Edition1)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1

CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-11-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### 20080012031

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_TRMM-PFM-VIRS\_Edition1)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Edition1)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012032

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Terra-FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Terra-FM1_Edition1)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the

ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1  
CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1  
CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-  
FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2  
CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV  
CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-  
11-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180;  
Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - <  
Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### 20080012033

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Terra-FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Terra-FM2_Edition1)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1  
CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1  
CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-  
FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2  
CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV  
CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-  
11-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180;  
Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - <  
Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### 20080012034

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Terra-FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Terra-FM1_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1  
CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-  
PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1  
CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-

FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012035

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Terra-FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Terra-FM2_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012036

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Terra-FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Terra-FM1_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm

that uses the available hourly data, scene identification data, and diurnal models. This algorithm is ‘like’ the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012037

### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Terra-FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Terra-FM2_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth’s Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is ‘like’ the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012038

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_FM1+FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_FM1+FM2_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012039

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_PFM+FM1+FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_PFM+FM1+FM2_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage:



Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012040

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_PFM+FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_PFM+FM1_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012041

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_PFM+FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_PFM+FM2_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1

CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1  
CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-  
PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2  
CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-  
FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-  
FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV  
CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV.  
[Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage:  
Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180]  
[Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250  
km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly;  
Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012042

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF)- Test data in HDF (CER\_SSF\_TRMM-PFM-VIRS\_Subset-Edition1)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Subset-Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Subset-Edition1)

[asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Subset-Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Subset-Edition1)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=1998-08-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012043

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_FM1+FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_FM1+FM2_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and

the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012044

### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_PFM+FM1+FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_PFM+FM1+FM2_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012045

### CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_PFM+FM1\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_PFM+FM1_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012046

### CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_PFM+FM2\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_PFM+FM2_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or

approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012047

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_TRMM-PFM-VIRS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Edition2A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012048

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_TRMM-ESA-VIRS\_Edition2-VIRSONly)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-ESA-VIRS\\_Edition2-VIRSONly](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-ESA-VIRS_Edition2-VIRSONly)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager

defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2001-07-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012049

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Edition2A-TransOps](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Edition2A-TransOps)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=1999-07-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

## 20080012050

### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_TRMM-PFM-VIRS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Edition2B)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSonly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=1998-04-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

## 20080012051

### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Terra-FM1\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Terra-FM1_Edition2)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180;

Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### **20080012052**

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Terra-FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Terra-FM2_Edition2)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### **20080012053**

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Terra-FM1\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Terra-FM1_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or



approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

#### **20080012054**

##### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Terra-FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Terra-FM2_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

#### **20080012055**

##### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Terra-FM1\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Terra-FM1_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2

CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012056

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Terra-FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Terra-FM2_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012057

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_FM1+FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_FM1+FM2_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages,

and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2002-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012058

### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_FM1+FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_FM1+FM2_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2002-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012059

### CERES BiDirectional Scans (BDS) data in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM1\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM1_Edition2)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

## 20080012060

### CERES BiDirectional Scans (BDS) data in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM2_Edition2)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### 20080012061

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_TRMM-PFM-VIRS\\_Edition2B-TransOps](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_TRMM-PFM-VIRS_Edition2B-TransOps)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=1999-07-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012062

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_TRMM-PFM-VIRS\_Beta4)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_TRMM-PFM-VIRS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_TRMM-PFM-VIRS_Edition2B)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

**20080012063****CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Terra-FM1-MODIS\_Edition1A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Terra-FM1-MODIS\\_Edition1A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Terra-FM1-MODIS_Edition1A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2002-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture***20080012064****CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Terra-FM1-MODIS\_Edition1A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Terra-FM2-MODIS\\_Edition1A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Terra-FM2-MODIS_Edition1A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-

MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2002-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012065

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_PFM+FM1+FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_PFM+FM1+FM2_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012066

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_PFM+FM1\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_PFM+FM1_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1

CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012067**

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_PFM+FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_PFM+FM2_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012068**

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_PFM+FM1+FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_PFM+FM1+FM2_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the



CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is ‘like’ the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012069

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_PFM+FM1\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_PFM+FM1_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth’s Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is ‘like’ the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012070

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_PFM+FM2\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_PFM+FM2_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012071

### CERES Monthly TOA and SRB Averages (SRBAVG) data in HDF-EOS Grid (CER\_SRBAVG\_TRMM-PFM-VIRS\_Edition2B)

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SRBAVG\\_TRMM-PFM-VIRS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SRBAVG_TRMM-PFM-VIRS_Edition2B)

The Monthly TOA/Surface Averages (SRBAVG) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SRBAVG is also produced for combinations of scanner instruments. The monthly average regional flux is estimated using diurnal models and the 1-degree regional fluxes at the hour of observation from the CERES SFC product. A second set of monthly average fluxes are estimated using concurrent diurnal information from geostationary satellites. These fluxes are given for both clear-sky and total-sky scenes and are spatially averaged from 1-degree regions to 1-degree zonal averages and a global average. For each region, the SRBAVG also contains hourly average fluxes for the month and an overall monthly average. The cloud properties from SFC are column averaged and are included on the SRBAVG. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-02-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

## 20080012072

### CERES BiDirectional Scans (BDS) data in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Aqua-FM4\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Aqua-FM4_Edition1)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-04-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

## 20080012073

### CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Aqua-FM4\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Aqua-FM4_Edition1)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

**20080012074**

**CERES Monthly Gridded Single Satellite Fluxes and Clouds (FSW) in HDF (CER\_FSW\_TRMM-PFM-VIRS\_Beta1)**  
[Data Set]

Wielicki, Bruce A., Principal Investigator; Barkstrom, Bruce R., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_FSW\\_TRMM-PFM-VIRS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_FSW_TRMM-PFM-VIRS_Edition2C)

The Monthly Gridded Radiative Fluxes and Clouds (FSW) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The FSW is also produced for combinations of scanner instruments. All instantaneous fluxes from the CERES CRS product for a month are sorted by 1-degree spatial regions and by the Universal Time (UT) hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the FSW along with other flux statistics and scene information. The mean adjusted fluxes at the four atmospheric levels defined by CRS are also included for both clear-sky and total-sky scenes. In addition, four cloud height categories are defined by dividing the atmosphere into four intervals with boundaries at the surface, 700-, 500-, 300-hPa, and the Top-of-the-Atmosphere (TOA). The cloud layers from CRS are put into one of the cloud height categories and averaged over the region. The cloud properties are also column averaged and included on the FSW. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology)*

**20080012075**

**CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Aqua-FM4\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Aqua-FM4_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

**20080012076**

**CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Aqua-FM4\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Aqua-FM4_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

**20080012077**

**CERES Clouds and Radiative Swath (CRS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_CRS\\_TRMM-PFM-VIRS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_CRS_TRMM-PFM-VIRS_Edition2C)

The Clouds and Radiative Swath (CRS) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The CRS contains all of the CERES SSF product data. For each CERES footprint on the SSF the CRS also contains vertical flux profiles evaluated at four levels in the atmosphere: the surface, 500-, 70-, and 1-hPa. The CRS fluxes and cloud parameters are adjusted for consistency with a radiative transfer model and adjusted fluxes are evaluated at the four atmospheric levels for both clear-sky and total-sky. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2000-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012078

#### **CERES BiDirectional Scans (BDS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Aqua-FM3\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Aqua-FM3_Edition1)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-11-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### 20080012079

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Aqua-FM3\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Aqua-FM3_Edition1)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-11-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### 20080012080

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Aqua-FM3\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Aqua-FM3_Edition1)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and

the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012081

### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Aqua-FM3\\_Edition1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Aqua-FM3_Edition1)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012082

### CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:>

[CER\\_ES4\\_FM1+FM2+FM3+FM4\\_Edition1](#)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012083

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:>

[CER\\_ES9\\_FM1+FM2+FM3+FM4\\_Edition1](#)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV.



[Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

#### **20080012084**

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Terra-FM1-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Terra-FM1-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Terra-FM1-MODIS_Edition2A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012085**

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Terra-FM2-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Terra-FM2-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Terra-FM2-MODIS_Edition2A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure,

optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSonly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### **20080012086**

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Terra-FM1-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Terra-FM1-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Terra-FM1-MODIS_Edition2A)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### **20080012087**

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Terra-FM2-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Terra-FM2-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Terra-FM2-MODIS_Edition2A)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky

scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012088**

##### **CERES Clouds and Radiative Swath (CRS) data in HDF. (CER\_CRS\_Terra-FM1-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_CRS\\_Terra-FM1-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_CRS_Terra-FM1-MODIS_Edition2A)

The Clouds and Radiative Swath (CRS) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The CRS contains all of the CERES SSF product data. For each CERES footprint on the SSF the CRS also contains vertical flux profiles evaluated at four levels in the atmosphere: the surface, 500-, 70-, and 1-hPa. The CRS fluxes and cloud parameters are adjusted for consistency with a radiative transfer model and adjusted fluxes are evaluated at the four atmospheric levels for both clear-sky and total-sky. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2001-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012089**

##### **CERES Clouds and Radiative Swath (CRS) data in HDF. (CER\_CRS\_Terra-FM2-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_CRS\\_Terra-FM2-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_CRS_Terra-FM2-MODIS_Edition2A)

The Clouds and Radiative Swath (CRS) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The CRS contains all of the CERES SSF product data. For each CERES footprint on the SSF the CRS also contains vertical flux profiles evaluated at four levels in the atmosphere: the surface, 500-, 70-, and 1-hPa. The CRS fluxes and cloud parameters are adjusted for consistency with a radiative transfer model and adjusted fluxes are evaluated at the four atmospheric levels for both clear-sky and total-sky. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2001-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012090**

##### **CERES BiDirectional Scans (BDS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Aqua-FM3\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Aqua-FM3_Edition2)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles

in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### **20080012091**

#### **CERES BiDirectional Scans (BDS) data in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Aqua-FM4\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Aqua-FM4_Edition2)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### **20080012092**

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Aqua-FM3\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Aqua-FM3_Edition2)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-

FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2  
CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV  
CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-  
12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180;  
Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - <  
Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### 20080012093

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Aqua-FM4\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Aqua-FM4_Edition2)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### 20080012094

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Aqua-FM3\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Aqua-FM3_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-

FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012095

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Aqua-FM4\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Aqua-FM4_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012096

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Aqua-FM3\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Aqua-FM3_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following

CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012097**

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Aqua-FM4\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Aqua-FM4_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012098**

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_FM1+FM3\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_FM1+FM3_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and

the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012099

### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_FM1+FM4\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_FM1+FM4_Edition2)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*



## 20080012100

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_FM1+FM3\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_FM1+FM3_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

## 20080012101

### CERES ERBE-like Monthly Regional Averages (ES-9) in HDF

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_FM1+FM4\\_Edition2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_FM1+FM4_Edition2)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-31] [Spatial\_Coverage:

Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012102

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Terra-FM1-MODIS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Terra-FM1-MODIS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Terra-FM1-MODIS_Edition2B)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012103

#### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Terra-FM2-MODIS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Terra-FM2-MODIS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Terra-FM2-MODIS_Edition2B)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances

for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSonly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### **20080012104**

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Terra-FM1-MODIS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Terra-FM1-MODIS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Terra-FM1-MODIS_Edition2B)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### **20080012105**

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Terra-FM2-MODIS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Terra-FM2-MODIS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Terra-FM2-MODIS_Edition2B)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL]

[Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2003-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].  
NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012106**

##### **CERES Clouds and Radiative Swath (CRS) data in HDF. (CER\_CRS\_Terra-FM1-MODIS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_CRS\\_Terra-FM1-MODIS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_CRS_Terra-FM1-MODIS_Edition2B)

The Clouds and Radiative Swath (CRS) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The CRS contains all of the CERES SSF product data. For each CERES footprint on the SSF the CRS also contains vertical flux profiles evaluated at four levels in the atmosphere: the surface, 500-, 70-, and 1-hPa. The CRS fluxes and cloud parameters are adjusted for consistency with a radiative transfer model and adjusted fluxes are evaluated at the four atmospheric levels for both clear-sky and total-sky. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012107**

##### **CERES Clouds and Radiative Swath (CRS) data in HDF. (CER\_CRS\_Terra-FM2-MODIS\_Edition2B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_CRS\\_Terra-FM2-MODIS\\_Edition2B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_CRS_Terra-FM2-MODIS_Edition2B)

The Clouds and Radiative Swath (CRS) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The CRS contains all of the CERES SSF product data. For each CERES footprint on the SSF the CRS also contains vertical flux profiles evaluated at four levels in the atmosphere: the surface, 500-, 70-, and 1-hPa. The CRS fluxes and cloud parameters are adjusted for consistency with a radiative transfer model and adjusted fluxes are evaluated at the four atmospheric levels for both clear-sky and total-sky. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2001-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

#### **20080012108**

##### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Aqua-FM3-MODIS\_Edition1B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM3-MODIS\\_Edition1B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM3-MODIS_Edition1B)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous

CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

## 20080012109

### **CERES Single Scanner Satellite Footprint, TOA, Surface Fluxes and Clouds (SSF) data in HDF (CER\_SSF\_Aqua-FM4-MODIS\_Edition1B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM4-MODIS\\_Edition1B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM4-MODIS_Edition1B)

[asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM4-MODIS\\_Edition1B](http://asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM4-MODIS_Edition1B)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012110

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Terra-FM1-MODIS\_Edition2C)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Terra-FM1-MODIS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Terra-FM1-MODIS_Edition2C)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012111

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Terra-FM2-MODIS\_Edition2C)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Terra-FM2-MODIS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Terra-FM2-MODIS_Edition2C)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012112

#### **CERES Monthly TOA and SRB Averages (SRBAVG) data in HDF-EOS Grid (CER\_SRBAVG\_Terra-FM1-MODIS\_Edition2C)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SRBAVG\\_Terra-FM1-MODIS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SRBAVG_Terra-FM1-MODIS_Edition2C)

The Monthly TOA/Surface Averages (SRBAVG) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SRBAVG is also produced for combinations of scanner instruments. The monthly average regional flux is estimated using diurnal models and the 1-degree

regional fluxes at the hour of observation from the CERES SFC product. A second set of monthly average fluxes are estimated using concurrent diurnal information from geostationary satellites. These fluxes are given for both clear-sky and total-sky scenes and are spatially averaged from 1-degree regions to 1-degree zonal averages and a global average. For each region, the SRBAVG also contains hourly average fluxes for the month and an overall monthly average. The cloud properties from SFC are column averaged and are included on the SRBAVG. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-02-01; Stop\_Date=2003-02-28] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### **20080012113**

#### **CERES Monthly TOA and SRB Averages (SRBAVG) data in HDF-EOS Grid (CER\_SRBAVG\_Terra-FM2-MODIS\_Edition2C)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SRBAVG\\_Terra-FM2-MODIS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SRBAVG_Terra-FM2-MODIS_Edition2C)

The Monthly TOA/Surface Averages (SRBAVG) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SRBAVG is also produced for combinations of scanner instruments. The monthly average regional flux is estimated using diurnal models and the 1-degree regional fluxes at the hour of observation from the CERES SFC product. A second set of monthly average fluxes are estimated using concurrent diurnal information from geostationary satellites. These fluxes are given for both clear-sky and total-sky scenes and are spatially averaged from 1-degree regions to 1-degree zonal averages and a global average. For each region, the SRBAVG also contains hourly average fluxes for the month and an overall monthly average. The cloud properties from SFC are column averaged and are included on the SRBAVG. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-02-01; Stop\_Date=2003-02-28] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### **20080012114**

#### **CERES Monthly Gridded Single Satellite Fluxes and Clouds (FSW) in HDF (CER\_FSW\_Terra-FM1-MODIS\_Edition2C)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; Barkstrom, Bruce R., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_FSW\\_Terra-FM1-MODIS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_FSW_Terra-FM1-MODIS_Edition2C)

The Monthly Gridded Radiative Fluxes and Clouds (FSW) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The FSW is also produced for combinations of scanner instruments. All instantaneous fluxes from the CERES CRS product for a month are sorted by 1-degree spatial regions and by the Universal Time (UT) hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the FSW along with other flux statistics and scene information. The mean adjusted fluxes at the four atmospheric levels defined by CRS are also included for both clear-sky and total-sky scenes. In addition, four cloud height categories are defined by dividing the atmosphere into four intervals with boundaries at the surface, 700-, 500-, 300-hPa, and the Top-of-the-Atmosphere (TOA). The cloud layers from CRS are put into one of the cloud height categories and averaged over the region. The cloud properties are also column averaged and included on the FSW. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage:

Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology)*

#### **20080012115**

#### **CERES) Monthly Gridded Single Satellite Fluxes and Clouds (FSW) in HDF (CER\_FSW\_Terra-FM2-MODIS\_Edition2C)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; Barkstrom, Bruce R., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_FSW\\_Terra-FM2-MODIS\\_Edition2C](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_FSW_Terra-FM2-MODIS_Edition2C)

The Monthly Gridded Radiative Fluxes and Clouds (FSW) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The FSW is also produced for combinations of scanner instruments. All instantaneous fluxes from the CERES CRS product for a month are sorted by 1-degree spatial regions and by the Universal Time (UT) hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the FSW along with other flux statistics and scene information. The mean adjusted fluxes at the four atmospheric levels defined by CRS are also included for both clear-sky and total-sky scenes. In addition, four cloud height categories are defined by dividing the atmosphere into four intervals with boundaries at the surface, 700-, 500-, 300-hPa, and the Top-of-the-Atmosphere (TOA). The cloud layers from CRS are put into one of the cloud height categories and averaged over the region. The cloud properties are also column averaged and included on the FSW. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2001-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology)*

#### **20080012116**

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds(SFC) data in HDF (CER\_SFC\_Aqua-FM3-MODIS\_Edition1B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Aqua-FM3-MODIS\\_Edition1B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Aqua-FM3-MODIS_Edition1B)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*



**20080012117****CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds(SFC) data in HDF (CER\_SFC\_Aqua-FM4-MODIS\_Edition1B)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Aqua-FM4-MODIS\\_Edition1B](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Aqua-FM4-MODIS_Edition1B)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

**20080012118****CERES BiDirectional Scans (BDS) data in HDF (CER\_BDS\_Terra-FM1\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM1\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM1_Edition1-CV)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-11-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

**20080012119****CERES BiDirectional Scans (BDS) data in HDF (CER\_BDS\_Terra-FM2\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Terra-FM2\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Terra-FM2_Edition1-CV)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles

in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-11-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### 20080012120

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF ( CER\_ES4\_Terra-FM1\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Terra-FM1\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Terra-FM1_Edition1-CV)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-09-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012121

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF ( CER\_ES4\_Terra-FM2\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Terra-FM2\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Terra-FM2_Edition1-CV)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and

the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012122**

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF (CER\_ES8\_Terra-FM1\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Terra-FM1\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Terra-FM1_Edition1-CV)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-09-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### **20080012123**

#### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF (CER\_ES8\_Terra-FM2\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Terra-FM2\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Terra-FM2_Edition1-CV)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models

(ADM)s). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

### **20080012124**

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF ( CER\_ES9\_Terra-FM1\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Terra-FM1\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Terra-FM1_Edition1-CV)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-09-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### **20080012125**

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF ( CER\_ES9\_Terra-FM2\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Terra-FM2\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Terra-FM2_Edition1-CV)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations

of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012126

#### **CERES BiDirectional Scans (BDS) data in HDF (CER\_BDS\_Aqua-FM3\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Aqua-FM3\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Aqua-FM3_Edition1-CV)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-11-02] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

### 20080012127

#### **CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF ( CER\_ES4\_Aqua-FM3\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Aqua-FM3\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Aqua-FM3_Edition1-CV)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and

the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

#### **20080012128**

##### **CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF (CER\_ES8\_Aqua-FM3\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Aqua-FM3\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Aqua-FM3_Edition1-CV)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2006-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

#### **20080012129**

##### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF ( CER\_ES9\_Aqua-FM3\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Aqua-FM3\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Aqua-FM3_Edition1-CV)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the

Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-10-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012130

#### **CERES Single Satellite Footprint, TOA and Surface Fluxes, Clouds (SSF) data in HDF (CER\_SSF\_Aqua-FM3-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM3-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM3-MODIS_Edition2A)

[asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM3-MODIS\\_Edition2A](http://asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM3-MODIS_Edition2A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONLY CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution:

Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012131

#### **CERES Single Satellite Footprint, TOA and Surface Fluxes, Clouds (SSF) data in HDF (CER\_SSF\_Aqua-FM4-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM4-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM4-MODIS_Edition2A)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-09-16] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012132

#### **CERES Monthly TOA and SRB Averages (SRBAVG) data in HDF-EOS Grid (CER\_SRBAVG\_Terra-FM1-MODIS\_Edition2D)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SRBAVG\\_Terra-FM1-MODIS\\_Edition2D](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SRBAVG_Terra-FM1-MODIS_Edition2D)

The Monthly TOA/Surface Averages (SRBAVG) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SRBAVG is also produced for combinations of scanner instruments. The monthly average regional flux is estimated using diurnal models and the 1-degree regional fluxes at the hour of observation from the CERES SFC product. A second set of monthly average fluxes are estimated using concurrent diurnal information from geostationary satellites. These fluxes are given for both clear-sky and total-sky scenes and are spatially averaged from 1-degree regions to 1-degree zonal averages and a global average. For each region, the SRBAVG also contains hourly average fluxes for the month and an overall monthly average. The cloud properties from SFC are column averaged and are included on the SRBAVG. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-02-01; Stop\_Date=2004-05-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree;



Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012133

#### **CERES Monthly TOA and SRB Averages (SRBAVG) data in HDF-EOS Grid (CER\_SRBAVG\_Terra-FM2-MODIS\_Edition2D)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SRBAVG\\_Terra-FM2-MODIS\\_Edition2D](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SRBAVG_Terra-FM2-MODIS_Edition2D)

The Monthly TOA/Surface Averages (SRBAVG) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SRBAVG is also produced for combinations of scanner instruments. The monthly average regional flux is estimated using diurnal models and the 1-degree regional fluxes at the hour of observation from the CERES SFC product. A second set of monthly average fluxes are estimated using concurrent diurnal information from geostationary satellites. These fluxes are given for both clear-sky and total-sky scenes and are spatially averaged from 1-degree regions to 1-degree zonal averages and a global average. For each region, the SRBAVG also contains hourly average fluxes for the month and an overall monthly average. The cloud properties from SFC are column averaged and are included on the SRBAVG. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-02-01; Stop\_Date=2004-05-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012134

#### **CERES BiDirectional Scans (BDS) data in HDF (CER\_BDS\_Aqua-FM4\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_BDS\\_Aqua-FM4\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_BDS_Aqua-FM4_Edition1-CV)

Each BiDirectional Scans (BDS) data product contains twenty-four hours of Level-1b data for each CERES scanner instrument mounted on each spacecraft. The BDS includes samples taken in normal and short Earth scan elevation profiles in both fixed and rotating azimuth scan modes (including space, internal calibration, and solar calibration views). The BDS contains Level-0 raw (unconverted) science and instrument data as well as the geolocated converted science and instrument data. The BDS contains additional data not found in the Level-0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations. The following CERES BDS data sets are currently available: CER\_BDS\_TRMM-PFM\_Edition1 CER\_BDS\_Terra-FM1\_Edition1 CER\_BDS\_Terra-FM2\_Edition1 CER\_BDS\_Terra-FM1\_Edition2 CER\_BDS\_Terra-FM2\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1 CER\_BDS\_Aqua-FM4\_Edition1 CER\_BDS\_Aqua-FM3\_Edition2 CER\_BDS\_Aqua-FM4\_Edition2 CER\_BDS\_Aqua-FM3\_Edition1-CV CER\_BDS\_Aqua-FM4\_Edition1-CV CER\_BDS\_Terra-FM1\_Edition1-CV CER\_BDS\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-03-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Infrared Radiation; Infrared Spectra; Radiance; Heat Sinks; Sensors; Visible Spectrum*

**20080012135****CERES ERBE-like Instantaneous TOA Estimates (ES-8) in HDF (CER\_ES8\_Aqua-FM4\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES8\\_Aqua-FM4\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES8_Aqua-FM4_Edition1-CV)

The ES-8 archival data product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere (TOA) reduced from spacecraft altitude unfiltered radiances using Earth Radiation Budget Experiment (ERBE) scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) Angular Distribution Models (ADMs). The ES-8 also includes the total (TOT), SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. The following CERES ES8 data sets are currently available: CER\_ES8\_TRMM-PFM\_Edition1 CER\_ES8\_TRMM-PFM\_Edition2 CER\_ES8\_TRMM-PFM\_Transient-Ops2 CER\_ES8\_Terra-FM1\_Edition1 CER\_ES8\_Terra-FM2\_Edition1 CER\_ES8\_Terra-FM1\_Edition2 CER\_ES8\_Terra-FM2\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1 CER\_ES8\_Aqua-FM4\_Edition1 CER\_ES8\_Aqua-FM3\_Edition2 CER\_ES8\_Aqua-FM4\_Edition2 CER\_ES8\_Aqua-FM3\_Edition1-CV CER\_ES8\_Aqua-FM4\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV CER\_ES8\_Terra-FM1\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation*

**20080012136****CERES ERBE-like Monthly Geographical Averages (ES-4) in HDF ( CER\_ES4\_Aqua-FM4\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES4\\_Aqua-FM4\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES4_Aqua-FM4_Edition1-CV)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The following CERES ES4 data sets are currently available: CER\_ES4\_FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition1 CER\_ES4\_PFM+FM1+FM2\_Edition2 CER\_ES4\_PFM+FM1\_Edition1 CER\_ES4\_PFM+FM2\_Edition1 CER\_ES4\_TRMM-PFM\_Edition1 CER\_ES4\_TRMM-PFM\_Edition2 CER\_ES4\_Terra-FM1\_Edition1 CER\_ES4\_Terra-FM2\_Edition1 CER\_ES4\_FM1+FM2\_Edition2 CER\_ES4\_Terra-FM1\_Edition2 CER\_ES4\_Terra-FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1 CER\_ES4\_Aqua-FM4\_Edition1 CER\_ES4\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES4\_Aqua-FM3\_Edition2 CER\_ES4\_Aqua-FM4\_Edition2 CER\_ES4\_FM1+FM3\_Edition2 CER\_ES4\_FM1+FM4\_Edition2 CER\_ES4\_PFM+FM1\_Edition2 CER\_ES4\_PFM+FM2\_Edition2 CER\_ES4\_Aqua-FM3\_Edition1-CV CER\_ES4\_Aqua-FM4\_Edition1-CV CER\_ES4\_Terra-FM1\_Edition1-CV CER\_ES4\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=1 month; Temporal\_Resolution\_Range=Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012137

#### **CERES ERBE-like Monthly Regional Averages (ES-9) in HDF ( CER\_ES9\_Aqua-FM4\_Edition1-CV)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_ES9\\_Aqua-FM4\\_Edition1-CV](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_ES9_Aqua-FM4_Edition1-CV)

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is 'like' the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes. The following CERES ES9 data sets are currently available: CER\_ES9\_FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition1 CER\_ES9\_PFM+FM1+FM2\_Edition2 CER\_ES9\_PFM+FM1\_Edition1 CER\_ES9\_PFM+FM2\_Edition1 CER\_ES9\_PFM+FM1\_Edition2 CER\_ES9\_PFM+FM2\_Edition2 CER\_ES9\_TRMM-PFM\_Edition1 CER\_ES9\_TRMM-PFM\_Edition2 CER\_ES9\_Terra-FM1\_Edition1 CER\_ES9\_Terra-FM2\_Edition1 CER\_ES9\_FM1+FM2\_Edition2 CER\_ES9\_Terra-FM1\_Edition2 CER\_ES9\_Terra-FM2\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1 CER\_ES9\_Aqua-FM4\_Edition1 CER\_ES9\_FM1+FM2+FM3+FM4\_Edition1 CER\_ES9\_Aqua-FM3\_Edition2 CER\_ES9\_Aqua-FM4\_Edition2 CER\_ES9\_FM1+FM3\_Edition2 CER\_ES9\_FM1+FM4\_Edition2 CER\_ES9\_Aqua-FM3\_Edition1-CV CER\_ES9\_Aqua-FM4\_Edition1-CV CER\_ES9\_Terra-FM1\_Edition1-CV CER\_ES9\_Terra-FM2\_Edition1-CV. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-29] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.5 degree; Longitude\_Resolution=2.5 degree; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=hourly, daily, monthly; Temporal\_Resolution\_Range=Hourly - < Daily, Daily - < Weekly, Monthly - < Annual].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo*

### 20080012138

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Aqua-FM3-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Aqua-FM3-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Aqua-FM3-MODIS_Edition2A)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012139

#### **CERES Monthly Gridded Single Satellite TOA and Surfaces/Clouds (SFC) data in HDF (CER\_SFC\_Aqua-FM4-MODIS\_Edition2A)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SFC\\_Aqua-FM4-MODIS\\_Edition2A](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SFC_Aqua-FM4-MODIS_Edition2A)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SFC is also produced for combinations of scanner instruments. All instantaneous shortwave, longwave, and window fluxes at the Top-of-the-Atmosphere (TOA) and surface from the CERES SSF product for a month are sorted by 1-degree spatial regions and by the local hour of observation. The mean of the instantaneous fluxes for a given region-hour bin is determined and recorded on the SFC along with other flux statistics and scene information. These average fluxes are given for both clear-sky and total-sky scenes. The regional cloud properties are column averaged and are included on the SFC. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-03-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=100] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree; Horizontal\_Resolution\_Range=100 km - < 250 km or approximately 1 degree - < 2.5 degrees; Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Short Wave Radiation; Long Wave Radiation; Albedo; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

### 20080012140

#### **CERES Single Satellite Footprint, TOA and Surface Fluxes, Clouds (SSF) data in HDF (CER\_SSF\_Aqua-FM4-MODIS\_Ed2A-NoSW)**

[Data Set]

Wielicki, Bruce A., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://eosweb.larc.nasa.gov/PRODOCS/ceres/table\\_ceres.html](http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html); [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER\\_SSF\\_Aqua-FM4-MODIS\\_Ed2A-NoSW](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES:CER_SSF_Aqua-FM4-MODIS_Ed2A-NoSW)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes. Only footprints with adequate imager coverage are included on CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 the SSF which is much less than the full set of footprints on the CERES ES-8 product. The following CERES SSF data sets are currently available: CER\_SSF\_TRMM-PFM-VIRS\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Subset\_Edition1 CER\_SSF\_TRMM-PFM-VIRS\_Edition2A CER\_SSF\_TRMM-ESA-VIRS\_Edition2\_VIRSONly CER\_SSF\_TRMM-PFM-VIRS\_Edition2A-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B-TransOps CER\_SSF\_TRMM-PFM-VIRS\_Edition2B CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition1A CER\_SSF\_Terra-FM1-MODIS\_Edition2A CER\_SSF\_Terra-FM2-MODIS\_Edition2A CER\_SSF\_Terra-FM1-MODIS\_Edition2B CER\_SSF\_Terra-FM2-MODIS\_Edition2B CER\_SSF\_Aqua-FM4-MODIS\_Beta1 CER\_SSF\_Aqua-FM3-MODIS\_Beta2 CER\_SSF\_Aqua-FM4-MODIS\_Beta2. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2006-01-01] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Temporal\_Resolution=1 hour; Temporal\_Resolution\_Range=Hourly - < Daily].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation; Long Wave Radiation; Atmospheric Pressure; Clouds (Meteorology); Atmospheric Moisture*

**20080012141**

**Surface Meteorology and Solar Energy (SSE) Data Release 5.1**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SSE:SSE>

The Surface meteorology and Solar Energy (SSE) data set contains over 200 parameters formulated for assessing and designing renewable energy systems. The SSE data set is formulated from NASA satellite- and reanalysis-derived insolation and meteorological data for the 10-year period July 1983 through June 1993. Results are provided for 1 degree latitude by 1 degree longitude grid cells over the globe. Average daily and monthly measurements for 1195 World Radiation Data Centre ground sites are also available. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=1993-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=1 degree].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Visible Infrared Spin Scan Radiometer; Atmospheric Radiation; NOAA 9 Satellite; NOAA 10 Satellite; Meteosat Satellite; GOES 6; GOES 7; Meteorological Satellites; Atmospheric Temperature; Meteorological Parameters; Albedo; Earth Surface; Atmospheric Pressure; Pressure Measurement; Clouds (Meteorology); Cloud Cover; Dew Point; Frost; Atmospheric Moisture; Humidity; Land Surface Temperature; Water Vapor; Precipitation (Meteorology); Precipitation Measurement; Solar Radiation; Sunlight; Surface Temperature; Atmospheric Circulation; Ground Wind*

**20080012143**

**Surface Radiation Budget (SRB) Release 2 Shortwave 3 hourly Monthly Data in Native Format (SRB\_REL2\_SW\_3HRLY\_MONTHLY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2\\_SW\\_3HRLY\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2_SW_3HRLY_MONTHLY)

The SRB data include the average upward and downward fluxes, photosynthetically active radiative flux, aerosol and cloud optical depth, cloud fraction, and solar zenith angle at three hourly intervals for each day for the entire globe between 07/01/1983 and 10/31/1995. These parameters were derived with the Shortwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=1998-07-26] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics 120 degrees (the poles); Temporal\_Resolution=3 hourly; Temporal\_Resolution\_Range=3 hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Aerosols; Optical Thickness; Solar Radiation; Light (Visible Radiation); Short Wave Radiation; Radiance; Clouds (Meteorology); Cloud Cover; Biosphere; Photosynthetically Active Radiation; Vegetation*

**20080012145**

**Surface Radiation Budget (SRB) Release 2 Shortwave Monthly Data in Native Format (SRB\_REL2\_SW\_MONTHLY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2\\_SW\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2_SW_MONTHLY)

The SRB data include the average upward and downward fluxes, photosynthetically active radiative flux, aerosol and cloud optical depth, cloud fraction, and solar zenith angle at three hourly intervals for each day for the entire globe between 07/01/1983 and 10/31/1995. These parameters were derived with the Shortwave algorithm of the NASA World Climate Research Programme /Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=1998-07-26] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree in the tropics to 120 degrees

at the poles.; Temporal\_Resolution=monthly; Temporal\_Resolution\_Range=monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Aerosols; Optical Thickness; Light (Visible Radiation); Solar Radiation; Radiance; Short Wave Radiation; Clouds (Meteorology); Cloud Cover; Biosphere; Photosynthetically Active Radiation; Vegetation*

#### **20080012146**

##### **Surface Radiation Budget (SRB) Release 2.5 QC Longwave 3 hourly Data in Native Format**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_QCLW\\_3HRLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCLW_3HRLY)

This data set contains average surface downward longwave flux, surface net longwave flux, and surface longwave cloud radiative forcing at three hourly intervals for each day for the entire globe between 07/01/1983 and 06/30/2005. These LW surface radiative parameters were derived with the Quality-Check LW (QCLW) algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=3-hourly; Temporal\_Resolution\_Range=3-hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Long Wave Radiation; Emittance; Radiance; Clouds (Meteorology)*

#### **20080012147**

##### **Surface Radiation Budget (SRB) Release 2.5 QC Longwave Daily Data in Native Format (SRB\_REL2.5\_QCLW\_DAILY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_QCLW\\_DAILY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCLW_DAILY)

The data set contains average surface downward longwave flux, surface net longwave flux, and surface longwave cloud radiative forcing measured at three hourly intervals for each day for the entire globe between 07/01/1983 and 6/30/2005. These LW surface radiative parameters were derived with the Quality-Check LW (QCLW) algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 Degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=daily; Temporal\_Resolution\_Range=daily].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Emittance; Long Wave Radiation; Radiance; Clouds (Meteorology)*

#### **20080012148**

##### **Surface Radiation Budget (SRB) Release 2.5 QC Longwave Monthly Data in Native Format (SRB\_REL2.5\_QCLW\_MONTHLY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_QCLW\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCLW_MONTHLY)

The surface radiation budget data include downward and net longwave fluxes, as well as three meteorological parameters

for the entire globe between 07/01/1983 and 06/30/2005. These parameters were derived within the Quality-Check LW (QCLW) algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=monthly; Temporal\_Resolution\_Range=monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Radiance; Long Wave Radiation; Emittance; Atmospheric Moisture; Water Vapor; Clouds (Meteorology); Cloud Cover; Land Surface Temperature*

### 20080012149

#### **Surface Radiation Budget (SRB) Release 2.5 Longwave 3 hourly Data in Native Format (SRB\_REL2.5\_LW\_3HRLY)** [Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_LW\\_3HRLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_LW_3HRLY)

The SRB data include upward and downward fluxes and day/night conditions measured at three hourly intervals for each day for the entire globe between 07/01/1983 and 06/30/2005. These LW surface and Top of the Atmosphere (TOA) radiative parameters were derived with the Longwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=3 hourly; Temporal\_Resolution\_Range=3 hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Emittance; Radiance; Long Wave Radiation; Clouds (Meteorology)*

### 20080012150

#### **Surface Radiation Budget (SRB) Release 2.5 Longwave 3 hourly Monthly Data in Native Format (SRB\_REL2.5\_LW\_3HRLY\_MONTHLY)** [Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_LW\\_3HRLY\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_LW_3HRLY_MONTHLY)

The surface radiation budget data include the average upward and downward fluxes at three hourly intervals for the entire globe between 07/01/1983 and 06/30/2005. These parameters were derived using the Longwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=3 hourly values averaged monthly; Temporal\_Resolution\_Range=monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Emittance; Solar Radiation; Radiance; Long Wave Radiation; Clouds (Meteorology)*

### 20080012151

#### Surface Radiation Budget (SRB) Release 2.5 Longwave Daily Data in Native Format (SRB\_REL2.5\_LW\_DAILY)

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_LW\\_DAILY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_LW_DAILY)

This SRB data set contains average Clear-sky upward and downward flux, surface upward and downward flux, and top of the atmosphere (TOA) upward flux measured at three hourly intervals for each day for the entire globe between 07/01/1983 and 06/30/2005. These LW surface and Top of Atmosphere (TOA) radiative parameters were derived with the Longwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles); Temporal\_Resolution=daily; Temporal\_Resolution\_Range=daily].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Radiance; Long Wave Radiation; Emittance; Clouds (Meteorology)*

### 20080012152

#### Surface Radiation Budget (SRB) Release 2.5 Longwave Monthly Data in Native Format (SRB\_REL2.5\_LW\_MONTHLY)

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_LW\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_LW_MONTHLY)

The Surface Radiation Budget Data include upward and downward fluxes averaged at monthly intervals for the entire globe between 07/01/1983 and 06/30/2005. These parameters were derived using the Longwave algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles); Temporal\_Resolution=3 hourly; Temporal\_Resolution\_Range=3 hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Emittance; Solar Radiation; Radiance; Long Wave Radiation; Clouds (Meteorology)*

### 20080012153

#### Surface Radiation Budget (SRB) Release 2.5 Longwave cloud props 3 hourly Data in Native Format (SRB\_REL2.5\_LW\_CLDPROPS\_3HRLY)

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_LW\\_CLDPROPS\\_3HRLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_LW_CLDPROPS_3HRLY)

The Surface Radiation Budget (SRB) data set contain 47 surface and cloud properties including cloud fraction, cloud visible optical depth, cloud top temperature, cloud top pressure, cloud base pressure, and cloud water and ice content for each of 5 cloud types and in total. In addition to these cloud properties, the parameters also include surface pressure, total column ozone, day/night flag, and precipitable water. All parameters were measured at three hourly intervals for each day for the entire globe between 07/01/1983 and 06/30/2005 and serve as inputs to the Global Energy and Water-Cycle Experiment (GEWEX) longwave algorithm (GLW). [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1



degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=3 hourly; Temporal\_Resolution\_Range=3 hourly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Atmospheric Chemistry; Ozone; Atmospheric Pressure; Atmospheric Temperature; Atmospheric Moisture; Water Vapor; Clouds (Meteorology); Cloud Cover; Drop Size; Optical Thickness; Land Surface Temperature; Earth Surface; Emissivity*

#### **20080012154**

#### **Surface Radiation Budget (SRB) Release 2.5 QC Shortwave Daily Data in Native Format (SRB\_REL2.5\_QCSW\_DAILY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_QCSW\\_DAILY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCSW_DAILY)

This data set contains average clear-sky surface insolation, all-sky surface insolation, surface absorbed SW flux, and all-sky surface albedo measured at daily intervals for each day for the entire globe between 07/01/1983 and 06/30/2005. These SW surface radiative parameters were derived with the Quality-Check SW (QCSW) algorithm of the NASA World Climate Research Programme/Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=daily; Temporal\_Resolution\_Range=daily].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Light (Visible Radiation); Solar Radiation; Radiance; Sunlight; Short Wave Radiation; Albedo; Earth Surface*

#### **20080012155**

#### **Surface Radiation Budget (SRB) Release 2.5 QC Shortwave Monthly Data in Native Format (SRB\_REL2.5\_QCSW\_MONTHLY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB\\_REL2.5\\_QCSW\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCSW_MONTHLY)

These surface radiation budget data include both surface and top of the atmosphere insolation fluxes as well as cloud fraction/amount for the entire globe between 07/01/1983 and 06/30/2005. These parameters were derived with the Quality-Check SW (QCSW) algorithm of the NASA World Climate Research Programme /Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree (tropics and subtropics) to 120 degrees (the poles).; Temporal\_Resolution=monthly; Temporal\_Resolution\_Range=monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Solar Radiation; Short Wave Radiation; Albedo; Atmospheric Moisture; Water Vapor; Clouds (Meteorology); Cloud Cover*

#### **20080012156**

#### **Surface Radiation Budget (SRB) Release 2.5 QC Longwave 3 Hourly Monthly Data in Native Format(SRB\_REL2.5\_QCLW\_3HRLY\_MONTHLY)**

[Data Set]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCLW_3HRLY_MONTHLY)

[SRB\\_REL2.5\\_QCLW\\_3HRLY\\_MONTHLY](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB:SRB_REL2.5_QCLW_3HRLY_MONTHLY)

These surface radiation budget data sets include downward fluxes and cloud radiative properties for the entire globe between 07/01/1983 and 06/30/2005. These parameters were parameters derived with the Quality-Check LW (QCLW) algorithm of the NASA World Climate Research Programme /Global Energy and Water-Cycle Experiment (WCRP/GEWEX) Surface Radiation Budget (SRB) Project. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1998-01-01; Stop\_Date=2004-12-31] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1 degree; Longitude\_Resolution=Ranges from 1 degree in the tropics to 120 degrees at the poles; Temporal\_Resolution=3 hourly averaged monthly].

NASA

*Advanced Very High Resolution Radiometer; Remote Sensors; Remote Sensing; Satellite Observation; Reflectance; Radiometers; Atmospheric Radiation; Visible Infrared Spin Scan Radiometer; Meteorological Satellites; GOES 10; GOES 6; GOES 7; GOES 8; GOES 9; Indian Spacecraft; Meteosat Satellite; NOAA 10 Satellite; NOAA 11 Satellite; NOAA 12 Satellite; NOAA 14 Satellite; NOAA 7 Satellite; Emittance; Long Wave Radiation; Clouds (Meteorology)*

### **20080012159**

#### **MISR Level 1A CCD Science data, all cameras V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL1A\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL1A_V1)

The Level 1A data are raw MISR data that are decommutated, reformatted 12-bit Level 0 data shifted to byte boundaries, i.e., reversal of square-root encoding applied and converted to 16 bit, and annotated (e.g., with time information). These data are used by the Level 1B1 processing algorithm to generate calibrated radiances. The science data output preserves the spatial sampling rate of the Level 0 raw MISR CCD science data. CCD data are collected during routine science observations of the sunlit portion of the Earth. Each product represents one 'granule' of data. A 'granule' is defined to be the smallest unit of data required for MISR processing. Also, included in the Level 1A product are pointers to calibration coefficient files provided for Level 1B processing. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Cameras; Satellite Observation; Remote Sensing; Visible Spectrum; Imagery; Sensors*

### **20080012161**

#### **MISR Level 1B1 Local Mode Radiance Data V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB1LM\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB1LM_V1)

The results of two types of processing are included in this product. First, the Radiance Scaling operation converts the camera's digital number output to a measure of energy incident on the front optical surface. The measurement is expressed in units called radiance (energy per unit area, wavelength, and solid angle) as defined by the International Standard (SI). Second, Radiance Conditioning modifies the radiances to remove instrument-dependent effects. Specifically, image sharpening is applied, and focal-plane scattering is removed. Additionally, all radiances are adjusted to remove slight spectral sensitivity differences among the 1504 detector elements of each spectral band and each camera. In addition to the Level 1B1 radiometric product for MISR's Global Mode imagery, there is a separate Level 1B1 product for each high-resolution Local Mode scene. The Radiometric Product contains spectral radiances for all MISR channels (four spectral bands and nine cameras). Each radiance value represents the incident radiance averaged over the sensor's total band response. Processing includes both radiance scaling and conditioning steps. Radiance scaling converts the Level 1A data from digital counts to radiances using coefficients derived in combination with the On-Board Calibrator (OBC) and vicarious calibrations. The OBC contains Spectralon calibration panels which are deployed monthly and reflect sunlight into the cameras. The OBC detector standards then measure this reflected light to provide the calibration. Vicarious field campaigns are conducted less frequently but provide an independent methodology useful for reducing systematic errors. Radiance conditioning removes undesirable instrument effects. Image enhancement is provided by deconvolving the scene with the sensor's point-spread-function. Additionally,

in-band scaling adjusts the reported radiances to correspond to a nominal band response profile. This frees the Level 2 software from the need to correct for detector element non-uniformities. No out-of-band correction is done for this product, nor are the data geometrically corrected or resampled at this point. In summary, the Level 1B1 Product contains the Data Numbers (DNs) radiometrically-scaled to radiances with no geometric resampling. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=275 m for red band only; Longitude\_Resolution=275 m for red band only; Horizontal\_Resolution\_Range=250 km - < 500 km or approximately 2.5 degrees - < 5.0 degrees; Temporal\_Resolution=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

### **20080012162**

#### **MISR Level 1B2 Terrain Data V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2T\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2T_V1)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The Terrain data are re-projected to the terrain altitude. In this product, surface data from all cameras will appear in the same geographic location. Thus, this product is the primary input to Level 2 aerosol/surface processing, which requires co-registration of the L1B2 imagery at the surface. Clouds will still be displaced due to their elevation above the surface, but this time with respect to the terrain rather than the ellipsoid. (The mountain location T is now assigned the geographic location at T, and the Cloud at F appears at the geographic location T.) In Level 2 aerosol/surface processing, algorithms are applied to screen out the clouds. Terrain data only exist for MISR blocks containing some land. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=563.2 km (cross-track); Longitude\_Resolution=140.8 km (along-track); Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

### **20080012163**

#### **MISR Level 1B2 Ellipsoid Data V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2E\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2E_V1)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The Ellipsoid product is referenced to the World Geodetic System 1984 (WGS84) ellipsoid, which approximates the Earth's shape at sea level. In this product, the radiances and associated altitudes are projected to the ellipsoid, so that higher elevation data appear displaced from their true location for non-nadir camera views, much as they are seen by the instrument. (A cloud at location F, or a mountain top at location T in the image below appears as if it is at location E.) The more oblique the camera view, or the higher in altitude the feature, the more displaced the elevated data will appear. This displacement is used to advantage in MISR stereo retrievals, and this product is the primary input to Level 2 top-of-atmosphere/cloud processing. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=563.2 km (cross-track); Longitude\_Resolution=140.8 km (along-track); Horizontal\_Resolution\_Range=250 meters - < 500 meters;

Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

#### **20080012164**

##### **MISR Level 1B1 Radiance Data V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B1\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B1_V1)

The results of two types of processing are included in this product. First, the Radiance Scaling operation converts the camera's digital number output to a measure of energy incident on the front optical surface. The measurement is expressed in units called radiance (energy per unit area, wavelength, and solid angle) as defined by the International Standard (SI). Second, Radiance Conditioning modifies the radiances to remove instrument-dependent effects. Specifically, image sharpening is applied, and focal-plane scattering is removed. Additionally, all radiances are adjusted to remove slight spectral sensitivity differences among the 1504 detector elements of each spectral band and each camera. The Radiometric Product contains spectral radiances for all MISR channels (four spectral bands and nine cameras). Each radiance value represents the incident radiance averaged over the sensor's total band response. Processing includes both radiance scaling and conditioning steps. Radiance scaling converts the Level 1A data from digital counts to radiances using coefficients derived in combination with the On-Board Calibrator (OBC) and vicarious calibrations. The OBC contains Spectralon calibration panels which are deployed monthly and reflect sunlight into the cameras. The OBC detector standards then measure this reflected light to provide the calibration. Vicarious field campaigns are conducted less frequently but provide an independent methodology useful for reducing systematic errors. Radiance conditioning removes undesirable instrument effects. Image enhancement is provided by deconvolving the scene with the sensor's point-spread-function. Additionally, in-band scaling adjusts the reported radiances to correspond to a nominal band response profile. This frees the Level 2 software from the need to correct for detector element non-uniformities. No out-of-band correction is done for this product, nor are the data geometrically corrected or resampled at this point. In summary, the Level 1B1 Product contains the Data Numbers (DNs) radiometrically-scaled to radiances with no geometric resampling. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=275 m for red band only; Longitude\_Resolution=275 m for red band only; Horizontal\_Resolution\_Range=250 meters - < 500 meters; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly, about 15 orbits/day, Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

#### **20080012165**

##### **MISR Level 2 TOA/Cloud Albedo parameters V001**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCAL\\_V1](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCAL_V1)

The TOA/Cloud Albedo data contain albedo values, including finely-sampled or local (2.2 km) TOA albedos registered to the RLRA, and two coarsely-sampled (35.2 km resolution) TOA albedos projected to 30-km altitude. The local (2.2 km) albedos do not take the obscuration of cloud features into account, so they should only be treated as traditional albedos when the number of obscured pixels is low. The restrictive and expansive albedos are both available at 35.2 km resolution: the restrictive albedos are only calculated using the radiation upwelling from the pixel under consideration, whereas the expansive albedos use all the radiation emanating from the surrounding area. Therefore, the expansive albedo is closer to the traditional definition of top-of-atmosphere albedos. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=35.2 km; Longitude\_Resolution=35.2 km; Horizontal\_Resolution\_Range=10 km - < 50 km or approximately .09 degree - < .5 degree; Temporal\_Resolution=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing; Albedo; Atmospheric Radiation; Clouds (Meteorology); Earth Surface; Reflectance; Surface Properties; Heat Budget; Oceans*

**20080012168**

**MISR Camera Geometry Model V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISANCGM\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISANCGM_V2)

The CGM dataset is used to describe pointing geometry of the nine MISR cameras. It consists of a set of parameters used in a mathematical expression that gives the pointing direction of an arbitrary pixel in the spacecraft attitude frame of reference. These parameters represent the geometry of the camera system and account for distortions from an ideal optical system..  
NASA

*MISR (Radiometry); Descriptive Geometry; Angles (Geometry)*

**20080012169**

**MISR Browse data V003**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISBR\\_V3](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISBR_V3)

A MISR Browse Tool is available to allow easy access to ellipsoid-derived, true-color images for each camera reduced to 2.2 km resolution. The MISR red, green and blue bands are used to create the true-color image in JPEG format. The image is intentionally clipped and gamma-stretched to make cloud, ocean and land features visible. The user may find the Browse Tool helpful before ordering data. The tool's purpose is to search and view images in the on-line user interface. However, the browse product can be ordered separately. The Browse Tool page has Orbit-to-Date and Lat/Lon-to-Path/Block conversion tools to help identify particular MISR geographic locations and data files. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.2 km; Longitude\_Resolution=2.2 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Infrared Imagery; Infrared Spectra; Visible Spectrum; Imagery*

**20080012171**

**MISR Browse data V004**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISBR\\_V4](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISBR_V4)

A MISR Browse Tool is available to allow easy access to ellipsoid-derived, true-color images for each camera reduced to 2.2 km resolution. The MISR red, green and blue bands are used to create the true-color image in JPEG format. The image is intentionally clipped and gamma-stretched to make cloud, ocean and land features visible. The user may find the Browse Tool helpful before ordering data. The tool's purpose is to search and view images in the on-line user interface. However, the browse product can be ordered separately. The Browse Tool page has Orbit-to-Date and Lat/Lon-to-Path/Block conversion tools to help identify particular MISR geographic locations and data files. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.2 km; Longitude\_Resolution=2.2 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Infrared Imagery; Infrared Spectra; Visible Spectrum; Imagery*

**20080012172**

**MISR Level 1B2 Local Mode Ellipsoid Radiance Data V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MB2LME\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MB2LME_V2)

In addition to the Level 1B2 Global Mode imagery, MISR can be configured to disable the on-board data averaging and

provide high resolution images in all 36 channels for selected targets and observation times. This capability is referred to as Local Mode (LM). [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=275 m x 360 km (cross-track); Longitude\_Resolution=275 m x 300 km (along-track)].

NASA

*MISR (Radiometry); Radiance; Satellite Imagery*

### **20080012173**

#### **MISR Level 1B2 Local Mode Terrain Radiance Data V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MB2LMT\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MB2LMT_V2)

In addition to the Level 1B2 Global Mode imagery, MISR can be configured to disable the on-board data averaging and provide high resolution images in all 36 channels for selected targets and observation times. This capability is referred to as Local Mode (LM). [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=275 m x 360 km (cross-track); Longitude\_Resolution=275 m x 300 km (along-track)].

NASA

*MISR (Radiometry); Radiance; Satellite Imagery; Terrain*

### **20080012174**

#### **MISR Level 1B1 Radiance Data V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B1\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B1_V2)

The results of two types of processing are included in this product. First, the Radiance Scaling operation converts the camera's digital number output to a measure of energy incident on the front optical surface. The measurement is expressed in units called radiance (energy per unit area, wavelength, and solid angle) as defined by the International Standard (SI). Second, Radiance Conditioning modifies the radiances to remove instrument-dependent effects. Specifically, image sharpening is applied, and focal-plane scattering is removed. Additionally, all radiances are adjusted to remove slight spectral sensitivity differences among the 1504 detector elements of each spectral band and each camera. The Radiometric Product contains spectral radiances for all MISR channels (four spectral bands and nine cameras). Each radiance value represents the incident radiance averaged over the sensor's total band response. Processing includes both radiance scaling and conditioning steps. Radiance scaling converts the Level 1A data from digital counts to radiances using coefficients derived in combination with the On-Board Calibrator (OBC) and vicarious calibrations. The OBC contains Spectralon calibration panels which are deployed monthly and reflect sunlight into the cameras. The OBC detector standards then measure this reflected light to provide the calibration. Vicarious field campaigns are conducted less frequently but provide an independent methodology useful for reducing systematic errors. Radiance conditioning removes undesirable instrument effects. Image enhancement is provided by deconvolving the scene with the sensor's point-spread-function. Additionally, in-band scaling adjusts the reported radiances to correspond to a nominal band response profile. This frees the Level 2 software from the need to correct for detector element non-uniformities. No out-of-band correction is done for this product, nor are the data geometrically corrected or resampled at this point. In summary, the Level 1B1 Product contains the Data Numbers (DNs) radiometrically-scaled to radiances with no geometric resampling. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km; Longitude\_Resolution=1.1 km; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Visible Spectrum; Imagery*

**20080012175**

**MISR Level 1B2 Ellipsoid Data V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2E\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2E_V2)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The Ellipsoid product is referenced to the World Geodetic System 1984 (WGS84) ellipsoid, which approximates the Earth's shape at sea level. In this product, the radiances and associated altitudes are projected to the ellipsoid, so that higher elevation data appear displaced from their true location for non-nadir camera views, much as they are seen by the instrument. (A cloud at location F, or a mountain top at location T in the image below appears as if it is at location E.) The more oblique the camera view, or the higher in altitude the feature, the more displaced the elevated data will appear. This displacement is used to advantage in MISR stereo retrievals, and this product is the primary input to Level 2 top-of-atmosphere/cloud processing. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=563.2 km (cross-track); Longitude\_Resolution=140.8 km (along-track); Horizontal\_Resolution\_Range=500 meters - < 1 km; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Cameras; Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

**20080012176**

**MISR Level 1B2 Terrain Data V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2T\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2T_V2)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The Terrain data are re-projected to the terrain altitude. In this product, surface data from all cameras will appear in the same geographic location. Thus, this product is the primary input to Level 2 aerosol/surface processing, which requires co-registration of the L1B2 imagery at the surface. Clouds will still be displaced due to their elevation above the surface, but this time with respect to the terrain rather than the ellipsoid. (The mountain location T is now assigned the geographic location at T, and the Cloud at F appears at the geographic location T.) In Level 2 aerosol/surface processing, algorithms are applied to screen out the clouds. Terrain data only exist for MISR blocks containing some land. [Location=GLOBAL LAND] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=563.2 km (cross-track); Longitude\_Resolution=140.8 km (along-track); Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

**20080012177**

**MISR Level 1B1 Local Mode Radiance Data V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB1LM\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIB1LM_V2)

The results of two types of processing are included in this product. First, the Radiance Scaling operation converts the camera's digital number output to a measure of energy incident on the front optical surface. The measurement is expressed in units called radiance (energy per unit area, wavelength, and solid angle) as defined by the International Standard (SI). Second, Radiance Conditioning modifies the radiances to remove instrument-dependent effects. Specifically, image sharpening

is applied, and focal-plane scattering is removed. Additionally, all radiances are adjusted to remove slight spectral sensitivity differences among the 1504 detector elements of each spectral band and each camera. In addition to the Level 1B1 radiometric product for MISR's Global Mode imagery, there is a separate Level 1B1 product for each high-resolution Local Mode scene. The Radiometric Product contains spectral radiances for all MISR channels (four spectral bands and nine cameras). Each radiance value represents the incident radiance averaged over the sensor's total band response. Processing includes both radiance scaling and conditioning steps. Radiance scaling converts the Level 1A data from digital counts to radiances using coefficients derived in combination with the On-Board Calibrator (OBC) and vicarious calibrations. The OBC contains Spectralon calibration panels which are deployed monthly and reflect sunlight into the cameras. The OBC detector standards then measure this reflected light to provide the calibration. Vicarious field campaigns are conducted less frequently but provide an independent methodology useful for reducing systematic errors. Radiance conditioning removes undesirable instrument effects. Image enhancement is provided by deconvolving the scene with the sensor's point-spread-function. Additionally, in-band scaling adjusts the reported radiances to correspond to a nominal band response profile. This frees the Level 2 software from the need to correct for detector element non-uniformities. No out-of-band correction is done for this product, nor are the data geometrically corrected or resampled at this point. In summary, the Level 1B1 Product contains the Data Numbers (DNs) radiometrically-scaled to radiances with no geometric resampling. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=275 m for red band only; Longitude\_Resolution=275 m for red band only; Temporal\_Resolution=about 15 orbits/day].

NASA

*Visible Spectrum; Imagery*

#### **20080012179**

##### **MISR Level 1A CCD Science data, all cameras V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL1A\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL1A_V2)

The Level 1A data are raw MISR data that are decommutated, reformatted 12-bit Level 0 data shifted to byte boundaries, i.e., reversal of square-root encoding applied and converted to 16 bit, and annotated (e.g., with time information). These data are used by the Level 1B1 processing algorithm to generate calibrated radiances. The science data output preserves the spatial sampling rate of the Level 0 raw MISR CCD science data. CCD data are collected during routine science observations of the sunlit portion of the Earth. Each product represents one 'granule' of data. A 'granule' is defined to be the smallest unit of data required for MISR processing. Also, included in the Level 1A product are pointers to calibration coefficient files provided for Level 1B processing. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Cameras; Satellite Observation; Remote Sensing; Visible Spectrum; Imagery; Sensors*

#### **20080012182**

##### **MISR Level 2 TOA/Cloud Albedo parameters V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCAL\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCAL_V2)

The TOA/Cloud Albedo data contain albedo values, including finely-sampled or local (2.2 km) TOA albedos registered to the RLRA, and two coarsely-sampled (35.2 km resolution) TOA albedos projected to 30-km altitude. The local (2.2 km) albedos do not take the obscuration of cloud features into account, so they should only be treated as traditional albedos when the number of obscured pixels is low. The restrictive and expansive albedos are both available at 35.2 km resolution: the restrictive albedos are only calculated using the radiation upwelling from the pixel under consideration, whereas the expansive albedos use all the radiation emanating from the surrounding area. Therefore, the expansive albedo is closer to the traditional definition of top-of-atmosphere albedos. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km; Longitude\_Resolution=1.1 km; Temporal\_Resolution=about 15 orbits/day].

NASA

*Albedo; Atmospheric Radiation; Clouds (Meteorology); Earth Surface; Reflectance; Surface Properties; Heat Budget; Oceans*



**20080012186**

**MISR Browse data V005**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISBR\\_V5](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MISBR_V5)

A MISR Browse Tool is available to allow easy access to ellipsoid-derived, true-color images for each camera reduced to 2.2 km resolution. The MISR red, green and blue bands are used to create the true-color image in JPEG format. The image is intentionally clipped and gamma-stretched to make cloud, ocean and land features visible. The user may find the Browse Tool helpful before ordering data. The tool's purpose is to search and view images in the on-line user interface. However, the browse product can be ordered separately. The Browse Tool page has Orbit-to-Date and Lat/Lon-to-Path/Block conversion tools to help identify particular MISR geographic locations and data files. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=2.2 km; Longitude\_Resolution=2.2 km; Horizontal\_Resolution\_Range=1 km - < 10 km or approximately .01 degree - < .09 degree; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=Daily - < Weekly].

NASA

*Cameras; Satellite Observation; Remote Sensing; Infrared Imagery; Infrared Spectra; Visible Spectrum; Imagery*

**20080012188**

**MISR Level 1B2 Ellipsoid Data V003**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2E\\_V3](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2E_V3)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The Ellipsoid product is referenced to the World Geodetic System 1984 (WGS84) ellipsoid, which approximates the Earth's shape at sea level. In this product, the radiances and associated altitudes are projected to the ellipsoid, so that higher elevation data appear displaced from their true location for non-nadir camera views, much as they are seen by the instrument. (A cloud at location F, or a mountain top at location T in the image below appears as if it is at location E.) The more oblique the camera view, or the higher in altitude the feature, the more displaced the elevated data will appear. This displacement is used to advantage in MISR stereo retrievals, and this product is the primary input to Level 2 top-of-atmosphere/cloud processing. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=563.2 km (cross-track); Longitude\_Resolution=140.8 km (along-track); Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Visible Spectrum; Imagery*

**20080012189**

**MISR Level 1B2 Terrain Data V003**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2T\\_V3](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MI1B2T_V3)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The Terrain data are re-projected to the terrain altitude. In this product, surface data from all cameras will appear in the same geographic location. Thus, this product is the primary input to Level 2 aerosol/surface processing, which requires co-registration of the L1B2 imagery at the surface. Clouds will still be displaced due to their elevation above the surface, but this time with respect to the terrain rather than the ellipsoid. (The mountain location T is now assigned the geographic location at T, and the Cloud at F appears at the geographic location T.)

In Level 2 aerosol/surface processing, algorithms are applied to screen out the clouds. Terrain data only exist for MISR blocks containing some land. [Location=GLOBAL LAND] [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=563.2 km (cross-track); Longitude\_Resolution=140.8 km (along-track).; Temporal\_Resolution=about 15 orbits/day; Temporal\_Resolution\_Range=about 15 orbits/day].

NASA

*Satellite Observation; Remote Sensing; Visible Spectrum; Imagery*

#### **20080012194**

##### **International Satellite Cloud Climatology Project (ISCCP) Ice Snow Product in Native (NAT) Format (ISCCP\_ICESNOW\_NAT)**

[Data Set]

Rosow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP\\_ICESNOW\\_NAT](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP:ISCCP_ICESNOW_NAT)

Since 1983 an international group of institutions has collected and analyzed satellite radiance measurements from up to five geostationary and two polar orbiting satellites to infer the global distribution of cloud properties and their diurnal, seasonal and interannual variations. The primary focus of the first phase of the project (1983-1995) was the elucidation of the role of clouds in the radiation budget (top of the atmosphere and surface). In the second phase of the project (1995 onwards) the analysis also concerns improving understanding of clouds in the global hydrological cycle. [Location=GLOBAL] [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=112 Km; Longitude\_Resolution=112 Km; Temporal\_Resolution=5-day].

NASA

*Analog to Digital Converters; Microwave Imagery; Remote Sensing; Satellite Imagery; Dmsp Satellites; Satellite Observation; Earth Cryosphere; Icebergs; Glaciers; Snow Cover; Ice; Earth Hydrosphere*

#### **20080012198**

##### **Surface Radiation Budget**

[Data Set (Project Description)]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SRB>

The Surface Radiation Budget (SRB) data sets contain global 3-hourly, daily and monthly averages of surface longwave and shortwave radiative properties, cloud amount, and meteorological properties computed using models. The main input data for these models include cloud information, top-of-atmosphere radiances and profiles of atmospheric water vapor and temperature. Some of the input data include Earth Radiation Budget Energy (ERBE) top-of-atmosphere clear-sky albedo and International Satellite Cloud Climatology Project (ISCCP) radiances and cloud amount. SRB parameters derived for the renewable energy community are also available from the Surface meteorology and Solar Energy (SSE) data set. Other SRB data are available from Clouds and the Earth's Radiant Energy System (CERES) and Multi-angle Imaging SpectroRadiometer (MISR). [Mission Objectives] The objective of the SRB Project is to produce and archive a global data set of shortwave (SW) and longwave (LW) surface and top of the atmosphere parameters. The data generated in the SRB project may be used in conjunction with other data sets to facilitate the development of renewable energy resources and increase understanding of radiative properties within the meteorological community. [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=2005-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Surface Radiation Budget Project; Earth Surface; Radiative Transfer; Data Products; Atmospheric Radiation*

#### **20080012199**

##### **Clouds and the Earth's Radiant Energy System**

[Data Set (Project Description)]

Wielicki, Bruce A., Principal Investigator; Barkstrom, Bruce R., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:CERES>

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS)

program. The CERES instrument provides radiometric measurements of the Earth's atmosphere from three broadband channels. The CERES missions are a follow-on to the successful Earth Radiation Budget Experiment (ERBE) mission. The first CERES instrument (PFM) was launched on November 27, 1997, as part of the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments (FM1 and FM2) were launched into polar orbit on board the EOS flagship Terra on December 18, 1999, and two additional CERES instruments (FM3 and FM4) were launched on board EOS Aqua on May 4, 2002. [Mission Objectives] The scientific justification for the CERES measurements can be summarized by three assertions: (1) changes in the radiative energy balance of the Earth-atmosphere system can cause long-term climate changes (e.g., carbon dioxide inducing global warming); (2) besides the systematic diurnal and seasonal cycles of incoming solar energy, changes in cloud properties (amount, height, optical thickness) cause the largest changes of the Earth's radiative energy balance; and (3) cloud physics is one of the weakest components of current climate models used to predict potential global climate change. CERES has four main objectives: 1) For climate change analysis, provide a continuation of the ERBE record of radiative fluxes at the top of the atmosphere (TOA), analyzed using the same algorithms that produced the ERBE data. 2) Double the accuracy of estimates of radiative fluxes at TOA and the Earth's surface. 3) Provide the first long-term global estimates of the radiative fluxes within the Earth's atmosphere. 4) Provide cloud property estimates that are consistent with the radiative fluxes from surface to TOA. [Temporal\_Coverage: Start\_Date=1997-12-27; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*CERES (Experiment); Remote Sensing; Earth Atmosphere; Atmospheric Radiation; Satellite Observation*

### 20080012200

#### Surface meteorology and Solar Energy

[Data Set (Project Description)]

Stackhouse, Paul W., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:SSE>

The Release 5.1 Surface meteorology and Solar Energy (SSE) data contains parameters formulated for assessing and designing renewable energy systems. Parameters fall under 11 categories including: Solar cooking, solar thermal applications, solar geometry, tilted solar panels, energy storage systems, surplus product storage systems, cloud information, temperature, wind, other meteorological factors, and supporting information. This latest release contains new parameters based on recommendations by the renewable energy industry and it is more accurate than previous releases. On-line plotting capabilities allow quick evaluation of potential renewable energy projects for any region of the world. The SSE data set is formulated from NASA satellite- and reanalysis-derived insolation and meteorological data for the 10-year period July 1983 through June 1993. Results are provided for 1 degree latitude by 1 degree longitude grid cells over the globe. Average daily and monthly measurements for 1195 World Radiation Data Centre ground sites are also available. [Mission Objectives] The SSE project contains insolation and meteorology data intended to aid in the development of renewable energy systems. Collaboration between SSE and technology industries such as the Hybrid Optimization Model for Electric Renewables ( HOMER ) may aid in designing electric power systems that employ some combination of wind turbines, photovoltaic panels, or diesel generators to produce electricity. [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=1993-06-30] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Surface Meteorology and Solar Energy Project; Insolation; Renewable Energy; Solar Energy; Data Products*

### 20080012201

#### Multi-angle Imaging SpectroRadiometer

[Data Set (Project Description)]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR>

MISR views the sunlit Earth simultaneously at nine widely spaced angles and provides ongoing global coverage with high spatial detail. Its imagery is carefully calibrated to provide accurate measures of the brightness, contrast, and color of reflected sunlight. MISR provides new types of information for scientists studying Earth's climate, such as the regional and global distribution of different types of atmospheric particles and aerosols. The change in reflection at different view angles provides the means to distinguish aerosol types, cloud forms, and land surface cover. Combined with stereoscopic techniques, this enables construction of 3-D cloud models and estimation of the total amount of sunlight reflected by Earth's diverse environments. MISR was built for NASA by the Jet Propulsion Laboratory (JPL) in Pasadena, California. It is part of NASA's first Earth Observing System (EOS) spacecraft, the Terra spacecraft, which was launched into polar orbit from Vandenberg

Air Force Base on December 18, 1999. MISR has been continuously providing data since February 24, 2000. [Mission Objectives] The MISR instrument acquires systematic multi-angle measurements for global monitoring of top-of-atmosphere and surface albedos and for measuring the shortwave radiative properties of aerosols, clouds, and surface scenes in order to characterize their impact on the Earth's climate. The Earth's climate is constantly changing -- as a consequence of both natural processes and human activities. Scientists care a great deal about even small changes in Earth's climate, since they can affect our comfort and well-being, and possibly our survival. A few years of below-average rainfall, an unusually cold winter, or a change in emissions from a coal-burning power plant, can influence the quality of life of people, plants, and animals in the region involved. The goal of NASA's Earth Observing System (EOS) is to increase our understanding of the climate changes that are occurring on our planet, and the reasons for these changes, so we are better equipped to anticipate and prepare for the future. The MISR instrument is a part of EOS. Its role is to measure the amount of sunlight scattered in different directions under natural conditions. These measurements will help quantify the amount of solar energy that heats the Earth's surface and atmosphere, and the changes that occur in them over the lifetime of the MISR instrument. From the MISR observations, we are also learning more about those components of the Earth's environment that scatter sunlight: particles in the atmosphere, the planet's surface, and clouds. MISR monitors changes in surface reflection properties, in atmospheric aerosol content and composition, and in cloudiness. Scientists use these data to study land use changes, air pollution, volcanic eruptions, as well as processes such as desertification, deforestation, and soil erosion. As part of the EOS program, computer models that predict future climate will be improved by the results of these studies. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*MISR (Radiometry); Satellite Observation; Spectroradiometers; Atmospheric Scattering; Reflectance*

## 47

### METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

**2008000382** Department of Defense, Arlington, VA USA

#### **Emergency Supplemental Appropriations for DoD Needs Arising from Hurricane Katrina at Selected DoD Components**

Granetto, Paul J; Marsh, Patricia A; Pfeil, Lorin T; Adu, Henry Y; Appiah, Emmanuel A; Lawrence, Charlisa D; Loftin, Sharon A; Straw, Richard W; Davis, Sonya T; Hart, Erin S; Sep 12, 2007; 54 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000FE-0010.002

Report No.(s): AD-A472182; IG/DOD-D-2007-121; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472182>

Between September 2005 and June 2006, Congress provided four emergency supplemental appropriations to the Department of Defense (DoD) to meet DoD needs arising from Hurricane Katrina and other hurricanes in the 2005 hurricane season. This report is one in a series of reports discussing the management and use of DoD funds to support the 2005 hurricane relief efforts. The Inspector General (IG), DoD, performed this audit to determine if the emergency supplemental appropriations for DoD needs arising from Hurricane Katrina and others were used for their intended purposes. Generally, the DoD Components the IG visited used the emergency supplemental appropriations for these needs. However, some of the Components did not manage the emergency supplemental appropriations efficiently. Components inefficiently used or allowed about \$26.8 million emergency supplemental appropriated funds, that could have been used by other Components for their Hurricane Katrina needs, to expire. One Component used \$219,347 of the emergency supplemental appropriation for needs that did not result from Hurricane Katrina, and three Components used about \$935,680 of the emergency supplemental appropriations to pay for expenses that were reimbursable by FEMA, but did not seek reimbursement from FEMA. In addition, other Components used about \$2.1 million of their regular appropriations for their Hurricane Katrina needs. At some of the Components, the IG could not determine if the funds were expended on their Hurricane Katrina needs because they did not use unique accounting codes to collect and record their Hurricane Katrina transactions. The Finding section of this report contains detailed recommendations. Implementing the recommendations would allow DoD to put funds to better use when natural disasters occur by improving funds allocation processes, and DoD could also recover \$935,680 in reimbursement from FEMA.

DTIC

*Appropriations; Defense Program; Disasters; Emergencies; Federal Budgets; Financial Management; Hurricanes*

**2008000383** Department of Defense, Arlington, VA USA

**Contract Administration of the Ice Delivery Contract between International American Products, Worldwide Services and the U.S. Army Corps of Engineers during the Hurricane Katrina Recovery Effort**

Jolliffe, Richard B; Burton, Bruce A; Culp, Deborah L; Wan, Bobbie S; Dutton, Gary B; Steinbauer, Jeffrey L; Herman, Rachel L; Kistler, Jonathan M; Johnson, Meredith H; Aug 24, 2007; 32 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000CG-0075.000

Report No.(s): AD-A472183; IG/DOD-D-2007-118; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472183>

The U.S. Army Corps of Engineers Principal Assistant Responsible for Contracting requested a review on the administration of the ice delivery process between International American Products, Worldwide Services and the U.S. Army Corps of Engineers. The U.S. Army Corps of Engineers Charleston District did not effectively administer the 2003 ice delivery contract for the Hurricane Katrina recovery effort. The Corps Charleston District did not provide adequate training and guidance for invoice processing over the National Ice/Water Mission. They made inaccurate or inadequately supported payments on 142 of the 342 invoices received in the amount of about \$262,000. These included underpayments of about \$79,000 and overpayments of about \$183,000. The end result was an overpayment of nearly \$104,000. Also, the invoices may have additional monetary impact that the Inspector General (IG), DoD was not able to quantify because of the lack of supporting documentation. In addition, FEMA's redirection of trucks caused unauthorized expenditure of Government funds for onward miles and standby time. The U.S. Army Corps of Engineers should provide training on procedures for accepting ice and documenting ice deliveries, and finalize the standard operating procedures for processing invoices. The Corps Charleston District should recoup \$103,723.52 in overpayments from International American Products, Worldwide Services. In addition, the U.S. Army Corps of Engineers should examine the accuracy of the data provided by the automated tracking system required by the 2006 ice delivery contract and determine whether future ice delivery contracts should include the use of automated tracking systems to process invoices. The Corps Charleston District personnel can improve internal controls for administering ice delivery contracts by ensuring that personnel performing the National Ice/Water Mission are provided with the appropriate guidance and are properly trained.

DTIC

*Contract Management; Engineers; Hurricanes; Ice; Management Planning*

**2008000555** Department of Defense, Arlington, VA USA

**Financial Management of Hurricane Katrina Relief Efforts at the U.S. Army Corps of Engineers**

Granetto, Paul J; Marsh, Patricia A; Pfeil, Lorin T; Battle, Pauletta P; Beamish, Shaneen J; Hull, Theresa S; Melendez, Leilani M; Hart, Erin S; Apr 6, 2007; 25 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000FE-0010.001

Report No.(s): AD-A472312; IG/DOD-D-2007-081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report discusses the accounting and reporting of the Federal Emergency Management Agency (FEMA) reimbursable funding authority as well as funding received from Congress to support Hurricane Katrina relief efforts at the USA Army Corps of Engineers (USACE). USACE is the nation's primary Federal engineering agency. USACE also provides technical advice to State and Federal officials by inspecting and assessing damaged areas. On August 29, 2005, Hurricane Katrina made landfall on the U.S. Gulf Coast causing major damage and loss of life in Alabama, Louisiana, and Mississippi. FEMA, the primary Federal agency responsible for providing emergency relief in the USA, gave reimbursable funding authority to USACE to provide support and other humanitarian assistance to the victims of the hurricane. In September 2005, the House Government Reform Committee and its Subcommittee on Financial Management (now the Subcommittee on Government Management, Finance, and Accountability) tasked the Secretary of Homeland Security to coordinate with the DoD Office of Inspector General to audit and provide oversight to ensure that FEMA funds were used for their intended purposes. This report is one in a series discussing the use of DoD resources to support Hurricane Katrina relief efforts. USACE reporting of obligations related to Hurricane Katrina relief efforts was not always timely and efficient. Specifically, USACE did not make timely updates to the Corps of Engineers Financial Management System or perform timely closeouts of mission assignments. USACE also did not reconcile mission assignments and corresponding amendments with FEMA and did not track all funding from Congress. As a result, USACE increased the risk of not accurately reporting obligations and expenditures.

DTIC

*Disasters; Engineers; Federal Budgets; Financial Management; Hurricanes*

**2008000563** Department of Defense, Arlington, VA USA

**Information Technology Management: Hurricane Katrina Disaster Recovery Efforts Related to Army Information Technology Resources**

Jolliffe, Richard B; Burton, Bruce A; Wiccarver, Jacqueline L; Kince, Therese M; Ryan, Susan R; Price, Matthew J; Cleveland, Karma J; N Pugh, Jacqueline; Milner, Jillisa H; Johnson, Meredith H; Oct 19, 2006; 25 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000AS-0135.000

Report No.(s): AD-A472325; IG/DOD-D-2007-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Who Should Read This Report and Why? Managers of DoD information systems should read this report because it emphasizes the importance of continuity of operations planning for critical systems that may be disrupted during disasters. Background: On August 29, 2005, Hurricane Katrina devastated the Gulf Coast states of Louisiana, Mississippi, Alabama, and Florida with Category 3 winds and torrential rain. This audit report is the first in a planned series of audits on the effects of Hurricane Katrina on DoD information technology resources. Two Army logistics information technology systems operated by the 321st Theater Materiel Management Center Rear, located in Baton Rouge, Louisiana, experienced communications disruptions as a result of Hurricane Katrina. The Army information technology resources affected by Hurricane Katrina in Baton Rouge were categorized as Mission Assurance Category II systems. DoD Instruction 8500.2, 'Information Assurance Implementation,' February 6, 2003, requires Mission Assurance Category II systems to have a disaster plan that enables mission- or business-essential functions to resume within 24 hours. DoD Directive 3020.26, 'Defense Continuity Plan,' September 8, 2004, requires DoD Components to develop, coordinate, and maintain continuity plans, to update and reissue plans every 2 years; and to test and exercise continuity plans at least annually, or otherwise as directed.

DTIC

*Disasters; Gulfs; Hurricanes; Information Systems*

**2008000583** Department of Defense, Arlington, VA USA

**U.S. Army Corps of Engineers' 'Operation Blue Roof' Project in Response to Hurricane Katrina**

Jolliffe, Richard B; Burton, Bruce A; Culp, Deborah L; Such, Lisa M; LaBelle, John G; Kendera, Angela M; Holaren, Jordan P; Gurtner, Jessica L; Padworski, Brian J; Johnson, Meredith H; Dec 22, 2006; 29 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000CG-0081.000

Report No.(s): AD-A472356; IG/DOD-D-2007-038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Operation Blue Roof program provides a free temporary roof for residential structures, schools, day care centers, and all publicly owned facilities. These temporary roofs provide short-term relief until the owner can make permanent repairs. The U.S. Army Corps of Engineers (USACE) manages the Operation Blue Roof program for the Federal Emergency Management Agency (FEMA). Congressmen Bennie G. Thompson and Bill Pascrell Jr. requested the USACE Inspector General to review the contracts awarded for Operation Blue Roof following Hurricane Katrina. Due to a lack of resources, the USACE requested that the DoD Office of Inspector General (IG/DoD) perform the review. The IG performed this review to determine whether the USACE properly awarded and administered contracts for temporary roofing repairs in response to Hurricane Katrina. They determined that, overall, the procurements were properly solicited and awarded. The USACE properly reviewed responsive proposals and conducted the source selection according to the methodology stated in the solicitation. As of August 2006, the USACE had not completed performance evaluations of the prime contractors; however, the USACE Internal Review Teams, Defense Contract Audit Agency auditors, and homeowner inquiry and complaint forms identified contractor performance issues. The USACE did not initially award prime contracts to small, minority, or locally owned firms because those firms were not among the top five most technically qualified responders. However, the USACE did award two contracts for temporary roofing repairs to small disadvantaged businesses in October 2005. The USACE St. Louis District office internal controls were adequate in that the IG identified no material internal control weaknesses in the award of temporary roofing repairs contracts.

DTIC

*Color; Contract Management; Engineers; Government Procurement; Hurricanes; Maintenance; Procedures; Roofs*

**2008000613** Stratton Park Engineering Co., Inc., Boulder, CO USA

**Development of Novel Instrumentation to Characterize Aerosol Inlets and Cloud Particles**

Lawson, Paul; Jul 2007; 83 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-02-C-0317

Report No.(s): AD-A472445; No Copyright; Avail.: Defense Technical Information Center (DTIC)

SPEC Incorporated was contracted in Phase II by the Office of Naval Research to develop innovative new technology to measure the size, shape and concentration of water drops and ice particles in clouds. This effort included the main SBIR Phase II contract and two options. The principal objectives of the main SBIR phase II contract and its two options are: Main Contract:

Development of a 2D-S (Stereo) cloud particle imaging probe. Option 1: Determine the feasibility of designing and developing a 3V-CPI probe. Option 2: Design and fabricate a 3V-CPI probe for use on research aircraft. One result of the Phase II research was the development of a new cloud particle-imaging probe, the 2D-S (Stereo) probe, which has been installed on four research aircraft and flown in four major field campaigns sponsored by the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA). A description of the 2D-S probe and scientific results from field campaigns are the subject of two refereed journal publications. A second result is the ongoing development of another innovative cloud particle imaging probe, called a 3V-CPI, which is essentially a combination of a 2D-S and the SPEC cloud particle imager. The 3V-CPI is being developed under a joint agreement between the Navy and the NSF, whereby two 3V-CPI probes are being developed in parallel under joint funding from both agencies. Both the Navy and NSF agreed to this arrangement to facilitate development of the 3V-CPI under available funding. The Navy 3V-CPI will undergo final assembly and testing and be delivered to CIRPAS for use in the VOCALS field campaign scheduled for autumn 2008 in Chile. The NSF instrument, which is essentially identical to the Navy instrument, will be tested on the NSF owned Gulfstream V research aircraft before the Navy probe is delivered.

DTIC

*Aerosols; Instruments*

**2008000804** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Logistics: Use of DoD Resources Supporting Hurricane Katrina Disaster**

Scott, Wanda A; Bloomer, Donald A; Owens, Keith M; Bryant, Leon D; Matthews, Takia A; Chavez, Bryan M; Torres, Anthony M; Woolard, Alan J; Pugh, Jacqueline N; Oct 16, 2006; 63 pp.; In English

Report No.(s): AD-A472319; ODIGAD-D-2007-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We performed the audit in response to a September 2005 request by the Principal Deputy Inspector General, DoD to assess the use of DoD resources in providing relief efforts in support of the Hurricane Katrina disaster, and the impact on readiness resulting from the DoD resources affected by Hurricane Katrina and those supporting the relief efforts. The Secretary of Homeland Security is responsible for coordinating Federal operations within the USA to prepare for, respond to, and recover from major disasters and other emergencies. The Federal Emergency Management Agency, who represents the Secretary of Homeland Security, manages the Federal response and recovery efforts following any national incident. The Assistant Secretary of Defense (Homeland Defense) is the executive agent for Homeland Security with overall supervision for DoD homeland defense activities. The U.S. Northern Command is the DoD-supported combatant command for civil support within the USA. Active and Reserve Component military personnel are the supporting forces to the National Response Plan and provided Hurricane Katrina disaster relief efforts after the capabilities of the Federal Emergency Management Agency, the primary Federal agencies, and State and local first responders were exceeded. DoD has military resources that may be used in responding to a domestic crisis. However, there are limitations and restrictions on providing military support to civil authorities within the USA and its Territories. DoD Directive 3025.1 states that DoD Components cannot procure or maintain supplies, materiel, or equipment exclusively for providing military support to civil authorities and emergencies unless otherwise directed by the Secretary of Defense.

DTIC

*Disasters; Hurricanes; Maintainability; Resources*

**2008000844** NASA Langley Research Center, Hampton, VA, USA

**An Improved Algorithm for Retrieving Surface Downwelling Longwave Radiation from Satellite Measurements**

Zhou, Yaping; Kratz, David P.; Wilber, Anne C.; Gupta, Shashi K.; Cess, Robert D.; [2007]; 34 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NRA-02-OES-06; WBS 921266.04.07.07; WBS 509496.02.01.01.07; UPN 291-01-97-05; UPN 291-01-c7; Copyright; Avail.: CASI: A03, Hardcopy

Zhou and Cess [2001] developed an algorithm for retrieving surface downwelling longwave radiation (SDLW) based upon detailed studies using radiative transfer model calculations and surface radiometric measurements. Their algorithm linked clear sky SDLW with surface upwelling longwave flux and column precipitable water vapor. For cloudy sky cases, they used cloud liquid water path as an additional parameter to account for the effects of clouds. Despite the simplicity of their algorithm, it performed very well for most geographical regions except for those regions where the atmospheric conditions near the surface tend to be extremely cold and dry. Systematic errors were also found for scenes that were covered with ice clouds. An improved version of the algorithm prevents the large errors in the SDLW at low water vapor amounts by taking into account that under such conditions the SDLW and water vapor amount are nearly linear in their relationship. The new algorithm also utilizes cloud fraction and cloud liquid and ice water paths available from the Cloud and the Earth's Radiant

Energy System (CERES) single scanner footprint (SSF) product to separately compute the clear and cloudy portions of the fluxes. The new algorithm has been validated against surface measurements at 29 stations around the globe for Terra and Aqua satellites. The results show significant improvement over the original version. The revised Zhou-Cess algorithm is also slightly better or comparable to more sophisticated algorithms currently implemented in the CERES processing and will be incorporated as one of the CERES empirical surface radiation algorithms.

Author

*Algorithms; Long Wave Radiation; Satellite Observation; Upwelling Water; Clouds (Meteorology); Earth Sciences; Radiative Transfer*

**20080000846** NASA Langley Research Center, Hampton, VA, USA

**Coincident Occurrences of Tropical Individual Cirrus Clouds and Deep Convective Systems Derived from TRMM Observations**

Lin, Bing; Xu, Kuan-Man; Minnis, Patrick; Wielicki, Bruce A.; Hu, Yongxiang; Chambers, Lin; Fan, Alice; Sun, Wenbo; [2007]; 19 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 720817.04.07.06; Copyright; Avail.: CASI: [A03](#), Hardcopy

Measurements of cloud properties and atmospheric radiation taken between January and August 1998 by the Tropical Rainfall Measuring Mission (TRMM) satellite were used to investigate the effect of spatial and temporal scales on the coincident occurrences of tropical individual cirrus clouds (ICCs) and deep convective systems (DCSs). It is found that there is little or even negative correlation between instantaneous occurrences of ICC and DCS in small areas, in which both types of clouds cannot grow and expand simultaneously. When spatial and temporal domains are increased, ICCs become more dependent on DCSs due to the origination of many ICCs from DCSs and moisture supply from the DCS in the upper troposphere for the ICCs to grow, resulting in significant positive correlation between the two types of tropical high clouds in large spatial and long temporal scales. This result may suggest that the decrease of tropical high clouds with SST from model simulations is likely caused by restricted spatial domains and limited temporal periods. Finally, the radiative feedback due to the change in tropical high cloud area coverage with sea surface temperature appears small and about  $-0.14$  W/sq m per degree Kelvin.

Author

*Cloud Physics; Atmospheric Radiation; Cirrus Clouds; Tropical Regions*

**20080000848** NASA Langley Research Center, Hampton, VA, USA

**Physical Retrieval of Surface Emissivity Spectrum from Hyperspectral Infrared Radiances**

Li, Jun; Weisz, Elisabeth; Zhou, Daniel K.; [2007]; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 509496.02.01.01.03; Copyright; Avail.: CASI: [A03](#), Hardcopy

Retrieval of temperature, moisture profiles and surface skin temperature from hyperspectral infrared (IR) radiances requires spectral information about the surface emissivity. Using constant or inaccurate surface emissivities typically results in large retrieval errors, particularly over semi-arid or arid areas where the variation in emissivity spectrum is large both spectrally and spatially. In this study, a physically based algorithm has been developed to retrieve a hyperspectral IR emissivity spectrum simultaneously with the temperature and moisture profiles, as well as the surface skin temperature. To make the solution stable and efficient, the hyperspectral emissivity spectrum is represented by eigenvectors, derived from the laboratory measured hyperspectral emissivity database, in the retrieval process. Experience with AIRS (Atmospheric InfraRed Sounder) radiances shows that a simultaneous retrieval of the emissivity spectrum and the sounding improves the surface skin temperature as well as temperature and moisture profiles, particularly in the near surface layer.

Author

*Emissivity; Infrared Radiation; Algorithms; Infrared Spectra; Temperature Profiles; Atmospheric Moisture; Skin Temperature (Non-Biological)*

**20080000849** NASA Langley Research Center, Hampton, VA, USA

**Retrievals with the Infrared Atmospheric Sounding Interferometer**

Zhou, Daniel K.; Liu, Xu; Larar, Allen M.; Smith, William L.; Taylor, Jonathan P.; Schlüssel, Peter; Strow, L. Larrabee; Calbet, Xavier; Mango, Stephen A.; November 13, 2007; 1 pp.; In English; 1st IASI International Conference, 13-16 Nov. 2007, Anglet, France; Copyright; Avail.: Other Sources; Abstract Only

The Infrared Atmospheric Sounding Interferometer (IASI) on the MetOp satellite was launched on October 19, 2006. The Joint Airborne IASI Validation Experiment (JAIVEx) was conducted during April 2007 mainly for validation of the IASI on



the MetOp satellite. IASI possesses an ultra-spectral resolution of 0.25/cm and a spectral coverage from 645 to 2760/cm. Ultraspectral resolution infrared spectral radiance obtained from near nadir observations provide atmospheric, surface, and cloud property information. An advanced retrieval algorithm with a fast radiative transfer model, including cloud effects, is used for atmospheric profile and cloud parameter retrieval. Preliminary retrievals of atmospheric soundings, surface properties, and cloud optical/microphysical properties with the IASI observations during the JAIVEx are obtained and presented. These retrievals are further inter-compared with those obtained from airborne FTS system, such as the NPOESS Airborne Sounder Testbed Interferometer (NAST-I), dedicated dropsondes, radiosondes, and ground based Raman Lidar. The capabilities of satellite ultra-spectral sounder such as the IASI are investigated.

Author

*Infrared Interferometers; Atmospheric Sounding; Cloud Physics; Infrared Radiation; Optical Properties; Radiosondes; Radiative Transfer*

**2008000873** NASA Langley Research Center, Hampton, VA, USA

**Comparison of Cloud Properties from CALIPSO-CloudSat and Geostationary Satellite Data**

Nguyen, L.; Minnis, P.; Chang, F.; Winker, D.; Sun-Mack, S.; Spangenberg, D.; Austin, R.; October 22, 2007; 1 pp.; In English; A-Train-Lille 07 0 Symposium: Bringing together A-Train Observations and Modelling to Understand Aerosols and Clouds, 22-25 Oct. 2007, Lille, France; Copyright; Avail.: Other Sources; Abstract Only

Cloud properties are being derived in near-real time from geostationary satellite imager data for a variety of weather and climate applications and research. Assessment of the uncertainties in each of the derived cloud parameters is essential for confident use of the products. Determination of cloud amount, cloud top height, and cloud layering is especially important for using these real-time products for applications such as aircraft icing condition diagnosis and numerical weather prediction model assimilation. Furthermore, the distribution of clouds as a function of altitude has become a central component of efforts to evaluate climate model cloud simulations. Validation of those parameters has been difficult except over limited areas where ground-based active sensors, such as cloud radars or lidars, have been available on a regular basis. Retrievals of cloud properties are sensitive to the surface background, time of day, and the clouds themselves. Thus, it is essential to assess the geostationary satellite retrievals over a variety of locations. The availability of cloud radar data from CloudSat and lidar data from CALIPSO make it possible to perform those assessments over each geostationary domain at 0130 and 1330 LT. In this paper, CloudSat and CALIPSO data are matched with contemporaneous Geostationary Operational Environmental Satellite (GOES), Multi-functional Transport Satellite (MTSAT), and Meteosat-8 data. Unlike comparisons with cloud products derived from A-Train imagers, this study considers comparisons of nadir active sensor data with off-nadir retrievals. These matched data are used to determine the uncertainties in cloud-top heights and cloud amounts derived from the geostationary satellite data using the Clouds and the Earth's Radiant Energy System (CERES) cloud retrieval algorithms. The CERES multi-layer cloud detection method is also evaluated to determine its accuracy and limitations in the off-nadir mode. The results will be useful for constraining the use of the passive retrieval data in models and for improving the accuracy of the retrievals.

Author

*CloudSat; Cloud Physics; Numerical Weather Forecasting; GOES Satellites; Meteosat Satellite; Geosynchronous Orbits; Real Time Operation; Cloud Height Indicators*

**2008000919** NASA Langley Research Center, Hampton, VA, USA

**CALIPSO Mission Status Update: Payload Status**

Verhappen, Ron; Borchardt, Robert; MacDonnell, David; Cisewski, Mike; November 13, 2007; 31 pp.; In English; CALIPSO Mission Operations Mission Status Meeting, 13-14 Nov. 2007, Toulouse, France; Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The CALIPSO mission payload status update is presented. The contents include: 1) Wide Field Camera Overview; 2) WFC Temperatures; 3) WFC Voltages; 4) Imaging Infrared Radiometer (IIR) Health; 5) IIR Voltages; 6) Payload Control (PLC) Voltages; 7) PLC Temperatures; 8) Low Voltage Power Supply (LVPS) (CALOPS0025N); 9) PLC Radiation Effects; 10) SDS Status (CALOPS0020N); 11) CALIOP LIDAR; 12) Laser Energy Trends; 13) Laser Energy Zoom; 14) Laser Management Approach; 15) Green / Red Ratio; 16) Pedestal @ SHG Temperature Trends; 17) LOM Heater Duty Cycle Trends; 18) LOM Pressure Trends; 19) Boresight Trend; 20) 1064 Dark Noise Trend; 21) 532 SNR Trend; 22) Spike Trends; 23) LIDAR Highlights; 24) Backup Laser Status; and 25) Future Plans.

CASI

*Payloads; Space Missions; CALIPSO (Pathfinder Satellite); Optical Radar*

**20080001208** Army Cold Regions Research and Engineering Lab., Hanover, NH USA

**Measuring Energetics Residues on Snow**

Walsh, Michael R; Walsh, Marianne E; Ramsey, Charles A; Oct 2007; 34 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A472953; ERDC/CRREL-TR-07-19; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Quantifying energetics residues resulting from firing and detonating military munitions are necessary components in developing range sustainability models and plans. Determination of the residue plume area, discrimination from previous activities, separation of the residues from the collection matrix, and processing of the samples are all difficult tasks when dealing with residues on soils. To circumvent these problems, the U.S. Army Cold Regions Research and Engineering Laboratory has been sampling for energetics residues on snow. At firing points, a clean snow surface allows the collection of residues from a known quantity and type of munition and testing can be performed in conjunction with a scheduled training exercise. Detonation residues from live-fire training can be sampled on a snow-covered surface in an active impact area when the area fired into has not been utilized since the last snowfall. Tests with blown-in-place munitions may be conducted on clean snow-covered surfaces on active impact areas as well. This report outlines the methods developed by CRREL over the last seven years for sampling residues on snow and deriving estimates for energetics residues on a per-round basis. Sampling, quality control, and sample processing methods are covered.

DTIC

*Ammunition; Propellants; Residues; Snow*

**20080001232** Ohio State Univ., Columbus, OH USA

**Detection of Daytime Arctic Clouds using MISR and MODIS Data**

Shi, Tao; Clothiaux, Eugene E; Yu, Bin; Braverman, Amy J; Groff, David N; Mar 2006; 25 pp.; In English

Contract(s)/Grant(s): W911NF-05-1-0104

Report No.(s): AD-A473001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Amongst the spectral radiances available on the Moderate Resolution Imaging Spectroradiometer (MODIS) 7 are used operationally for detection of clouds in daytime polar regions. While the information content of clouds inherent in spectral radiances is familiar, the information content of clouds contained in angular radiances (i.e., radiances emanating to space from the same object but in different directions) is not. The Multi-angle Imaging Spectroradiometer (MISR) measures angular radiances to space and its collocation on the NASA Terra satellite with MODIS allows for a comparative analysis of its cloud detection capabilities with those of MODIS. Expert labels are used to compare arctic cloud detection efficiencies of several methods based on MISR radiances and radiance-based features, MODIS radiances and radiance-based features, and their combinations. Fisher's quadratic discriminate analysis (QDA) with expert labels is applied to MISR radiances, MISR radiance-based features, MODIS radiances, and MODIS radiance-based features. Accuracies increase when QDA with expert labels is applied to combined radiances (features) from both MISR and MODIS. These results are indicative of the information content inherent in spectral and angular radiances, but these classifiers are impossible to obtain in practice due to their reliance on expert labels. A second group of classifiers, also QDA-based, used automatic training labels from thresholding on combined MISR and MODIS radiance-based features. Training a QDA classifier on the MODIS mask did not improve classification accuracy. These results suggest that both MISR and MODIS radiances have sufficient information content for cloud detection in daytime polar regions. These results imply that further analysis of daytime cloud masks obtained from MISR and MODIS radiances over much larger spatial and temporal scales is a worthwhile endeavor.

DTIC

*Arctic Regions; Daytime; MISR (Radiometry); Spectroradiometers*

**20080001239** California Univ., Berkeley, CA USA

**MISR Cloud Detection over Ice and Snow Based on Linear Correlation Matching**

Shi, Tao; Yu, Bin; Braverman, Amy; Sep 2003; 15 pp.; In English

Contract(s)/Grant(s): FD01-12731; DAAD19-01-1-0643

Report No.(s): AD-A473013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cloud detection is a crucial step in any climate modelling or prediction. Multi-angle Imaging SpectroRadiometer 'MISR' was launched in 1999 by NASA to provide 9 angle and 4 band data to retrieve or estimate the cloud height and hence cloud detection. However, cloud detection even with MISR data has been proven very difficult over ice and snow. In this paper, we bypass the cloud height estimation step to directly tackle cloud detection by using features of ice and snow 'no cloud' pixels from different MISR angles. We propose the linear correlation matching classification 'LCMC' algorithm based on Fisher linear correlation tests. We compare LCMC with the Stereoscopically-Derived Cloud Mask 'SDCM', which is the cloud mask

from MISR Level 2 Top-of-the atmosphere Cloud algorithm 'known as L2TC', and find that LCMC gives more coverage and more robust results judged by visual inspection of finer resolution images. LCMC can also detect the very thin clouds most of the time. Moreover, LCMC is computationally much faster than L2TC and easier to implement. We hope to combine LCMC with L2TC in the future to improve the accuracy of the L2TC cloud height retrieval.

DTIC

*Ice; MISR (Radiometry); Snow; Spectroradiometers*

**20080001459** NASA Langley Research Center, Hampton, VA, USA

**Workshop on the Impacts of Aviation on Climate Change**

Wuebbles, Donald J.; Gupta, Mohan L.; Ko, Malcolm K.; [2007]; 4 pp.; In English

Contract(s)/Grant(s): WBS 281945.02.05.01.07; Copyright; Avail.: Other Sources

Projections indicate that demand for aviation transportation will increase by more than two fold over the next few decades. Timely action is needed to understand and quantify the potential climate impacts of aviation emissions particularly given the sustained lapse over the last several years in U.S. research activities in this area. In response to the stated needs, a group of international experts participated in the Workshop on the Impacts of Aviation on Climate Change during June 7-9, 2006 in Boston, MA. The workshop focus was on the impacts of subsonic aircraft emissions in the UT/LS region and on the potential response of the climate system. The goals of the workshop were to assess and document the present state of scientific knowledge, to identify the key underlying uncertainties and gaps, to identify ongoing and further research needed, to explore the development of climate impact metrics, and to help focus the scientific community on the aviation-climate change research needs. The workshop concluded that the major ways that aviation can affect climate, in agreement with the 1999 assessment by the Intergovernmental Panel on Climate Change (IPCC), are the direct climate effects from CO<sub>2</sub> and water vapor emissions, the indirect forcing on climate resulting from changes in the distributions and concentrations of ozone and methane as a primary consequence of aircraft nitrogen oxide (NO<sub>x</sub>) emissions, the direct effects (and indirect effects on clouds) from emitted aerosols and aerosol precursors, and the climate effects associated with contrails and cirrus cloud formation.

Author

*Climate Change; Civil Aviation; Air Transportation; Subsonic Aircraft; Emission*

**20080001698** NASA Langley Research Center, Hampton, VA, USA

**Comparison of MISR and MODIS Cloud-Top Heights in the Presence of Cloud Overlap**

Naud, C. M.; Baum, B.; Pavolonis, M.; Heidinger, A.; Frey, R.; Zhang, H.; [2007]; 32 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 23-621-30-93; Copyright; Avail.: Other Sources

To address the issue of cloud property retrievals in multilayer cloud situations, coincident MISR and MODIS cloud-top heights retrieved above two vertically pointing radar sites (ARM-SGP and UK-CFARR) are compared for 36 scenes between March 2000 and October 2003. The difference between MODIS and MISR cloud-top heights is assessed for its ability to indicate situations of cloud overlap. MISR stereo cloud-top heights are known to be sensitive to low-level clouds of high contrast (between two camera views) even if high clouds with a wide range of optical thicknesses are also present in the scene. MODIS retrieved cloud-top heights do not experience this problem as long as the highest cloud layer has an optical thickness greater than approximately 1. Consequently, the difference in cloud-top heights between MODIS and MISR is often large and positive in multilayer situations. The comparison with radar cloud-top heights on a 16 scene subset confirmed that large differences were associated with multilayer situations, but also showed that small differences can be found in overlap situations if the highest layer is of large contrast or of extremely small optical thickness. Using a cloud-typing technique applied to MODIS data that can also identify areas containing cloud overlap, small differences were found to occur for 60% of all overlap pixels examined here, highlighting the weaknesses of the MODIS-MISR cloud-top height difference for cloud overlap detection. While the accuracy of the MODIS cloud-top height algorithm decreases as the cirrus optical thickness becomes less than 1, the MISR approach may still be able to infer an accurate cloud-top height depending on the cloud contrast between two view angles. However, synergy between the difference in MODIS-MISR cloud-top height analysis and the MODIS cloud-typing method could improve overlap detection and provide additional information on the cloud-top height of two distinct layers.

Author

*Cloud Cover; Cloud Height Indicators; Clouds (Meteorology)*

**20080001934** Naval Postgraduate School, Monterey, CA USA

**The Value of Numerical Forecast Products in Improving Tactical Air Delivery Methods**

Rost, Michael; Jun 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473399; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis investigates the development of an agent-based system to analyze meteorological model data and generate statistics for comparison purposes. With it, it is possible to research the value and level of improvement when utilizing different levels of atmospheric-model resolution for guidance in tactical decision aids. Our agent-based system automates the comparison of model data at a location in the model field with environmental data extracted from sensor data obtained from RAOB launches. Statistics were efficiently generated for the variability of the u and v components of the wind directions, to aid in the rapid determination of the variability of model data and its effects on targeting accuracy. By addressing the interoperability and adaptability of agents, this research demonstrates the usefulness of agents to extract information to rapidly compute mission-planning accuracy.

DTIC

*Air Cargo; Delivery; Forecasting; Mathematical Models; Meteorological Parameters; Numerical Analysis; Wind Direction*

**20080002106** SRI International Corp., Menlo Park, CA, USA; NASA Ames Research Center, Moffett Field, CA, USA

**Comparison of Water Vapor Measurements by Airborne Sun Photometer and Near-Coincident in Situ and Satellite Sensors during INTEX/ITCT 2004**

Livingston, J.; Schmid, B.; Redemann, J.; Russell, P. B.; Ramirez, S. A.; Eilers, J.; Gore, W.; Howard, S.; Pommier, J.; Fetzer, E. J.; Seaman, S. W.; Borbas, E.; Wolfe, D. E.; Thompson, A. M.; Journal of Geophysical Research; June 06, 2007; Volume 112; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNG04GM63G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2006JD007733>

We have retrieved columnar water vapor (CWV) from measurements acquired by the 14-channel NASA Ames Airborne Tracking Sun photometer (AATS-14) during 19 Jetstream 31 (J31) flights over the Gulf of Maine in summer 2004 in support of the Intercontinental Chemical Transport Experiment (INTEX)/Intercontinental Transport and Chemical Transformation (ITCT) experiments. In this paper we compare AATS-14 water vapor retrievals during aircraft vertical profiles with measurements by an onboard Vaisala HMP243 humidity sensor and by ship radiosondes and with water vapor profiles retrieved from AIRS measurements during eight Aqua overpasses. We also compare AATS CWV and MODIS infrared CWV retrievals during five Aqua and five Terra overpasses. For 35 J31 vertical profiles, mean (bias) and RMS AATS-minus-Vaisala layer-integrated water vapor (LWV) differences are -7.1 percent and 8.8 percent, respectively. For 22 aircraft profiles within 1 hour and 130 km of radiosonde soundings, AATS-minus-sonde bias and RMS LWV differences are -5.4 percent and 10.7 percent, respectively, and corresponding J31 Vaisala-minus-sonde differences are 2.3 percent and 8.4 percent, respectively. AIRS LWV retrievals within 80 km of J31 profiles yield lower bias and RMS differences compared to AATS or Vaisala retrievals than do AIRS retrievals within 150 km of the J31. In particular, for AIRS-minus-AATS LWV differences, the bias decreases from 8.8 percent to 5.8 percent, and the RMS difference decreases from 21.5 percent to 16.4 percent. Comparison of vertically resolved AIRS water vapor retrievals (LWVA) to AATS values in fixed pressure layers yields biases of -2 percent to +6 percent and RMS differences of -20 percent below 700 hPa. Variability and magnitude of these differences increase significantly above 700 hPa. MODIS IR retrievals of CWV in 205 grid cells (5 x 5 km at nadir) are biased wet by 10.4 percent compared to AATS over-ocean near-surface retrievals. The MODIS-Aqua subset (79 grid cells) exhibits a wet bias of 5.1 percent, and the MODIS-Terra subset (126 grid cells) yields a wet bias of 13.2 percent.

Author

*Atmospheric Moisture; Imaging Spectrometers; MODIS (Radiometry); Photometers; Water Vapor; Humidity; Comparison; Environmental Transport*

**20080002107** NASA Ames Research Center, Moffett Field, CA, USA

**Multi-Grid-Cell Validation of Satellite Aerosol Property Retrievals in INTEX/ITCT/ICARTT 2004**

Russell, P. B.; Livingston, J. M.; Redemann, J.; Schmid, B.; Ramirez, S. A.; Eilers, J.; Kahn, R.; Chu, D. A.; Remer, L.; Quinn, P. K.; Rood, M. J.; Wang, W.; Journal of Geophysical Research; May 08, 2007; Volume 112; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNG04GM63G; Copyright; Avail.: Other Sources

ONLINE: <http://dx.doi.org/10.1029/2006JD007606>

Aerosol transport off the US Northeast coast during the Summer 2004 International Consortium for Atmospheric Research on Transport and Transformation (ICARTT) Intercontinental Chemical Transport Experiment (INTEX) and Intercontinental

Transport and Chemical Transformation (ITCT) experiments produced a wide range of aerosol types and aerosol optical depth (AOD) values, often with strong horizontal AOD gradients. In these conditions we flew the 14-channel NASA Ames Airborne Tracking Sun photometer (AATS) on a Jetstream 31 (J31) aircraft. Legs flown at low altitude (usually less than 100 m ASL) provided comparisons of AATS AOD spectra to retrievals for 90 grid cells of the satellite radiometers MODIS-Terra, MODIS-Aqua, and MISR, all over the ocean. Characterization of the retrieval environment was aided by using vertical profiles by the J31 (showing aerosol vertical structure) and, on occasion, shipboard measurements of light scattering and absorption. AATS provides AOD at 13 wavelengths  $\lambda$  from 354 to 2138 nm, spanning the range of aerosol retrieval wavelengths for MODIS over ocean (466-2119 nm) and MISR (446-866 nm). Midvisible AOD on low-altitude J31 legs in satellite grid cells ranged from 0.05 to 0.9, with horizontal gradients often in the range 0.05 to 0.13 per 10 km. When possible, we used ship measurements of humidified aerosol scattering and absorption to estimate AOD below the J31. In these cases, which had J31 altitudes 60-110 m ASL (typical of J31 low-altitude transects), estimated midvisible AOD below the J31 ranged from 0.003 to 0.013, with mean 0.009 and standard deviation 0.003. These values averaged 6 percent of AOD above the 531 nm. MISR-AATS comparisons on 29 July 2004 in 8 grid cells (each  $\sim 17.6$  km  $\times$  17.6 km) show that MISR versions 15 and 16 captured the AATS-measured AOD gradient (correlation coefficient  $R^2 = 0.87$  to  $0.92$ ), but the MISR gradient was somewhat weaker than the AATS gradient. The large AOD (midvisible values up to  $\sim 0.9$ ) and differing gradients in this case produced root-mean-square (RMS) MISR-AATS AOD differences of 0.03 to 0.21 (9 to 31%). MISR V15 Angstrom exponent  $\alpha$  ( $= -\ln AOD / \ln \lambda$ ) was closer to AATS than was MISR V16. MODIS-AATS AOD comparisons on 8 overpasses using 61 grid cells (each nominally 10 km  $\times$  10 km) had  $R^2$  approximately 0.97, with RMS AOD difference approximately 0.03 (approximately 20%). About 87% of the MODIS AOD retrievals differed from AATS values by less than the predicted MODIS over-ocean uncertainty,  $\Delta \tau = \pm 0.03 \pm 0.05 \tau$ . In contrast to the small MODIS-AATS differences in AOD, MODIS-AATS differences in Angstrom exponent  $\alpha$  were large: RMS differences for  $\alpha$  (553, 855 nm) were 0.28 for MODIS-Terra and 0.64 for MODIS-Aqua; RMS differences for  $\alpha$  (855, 2119 nm) were larger still, 0.61 for MODIS-Terra and 1.14 for MODIS-Aqua. The largest MODIS-AATS Angstrom exponent differences were associated with small AOD values, for which MODIS AOD relative uncertainty is large. Excluding cases with AOD(855 nm) less than 0.1 reduced MODIS-AATS  $\alpha$  differences substantially. In one grid cell on 21 July 2004, smoke over cloud appeared to impair the MODIS-Aqua cloud mask, resulting in retrieved AODs that significantly exceeded AATS values. Experiments with extending MODIS retrievals into the glint mask yielded MODIS AODs consistently less than AATS AODs, especially at long wavelength, indicating that the current MODIS glint mask limits should not be reduced to the extent tried here. The sign of the AOD differences within the glint mask (MODIS AOD less than AATS AOD) is consistent with ship-measured wind speeds there.

Author

*Aerosols; Aqua Spacecraft; Atmospheric Circulation; Imaging Spectrometers; MODIS (Radiometry); Earth Observations (From Space); Environmental Transport*

**2008002322** NASA Marshall Space Flight Center, Huntsville, AL, USA

### **Effect of Convection on the Tropical Tropopause Layer over the Tropical Americas**

Pittman, Jasna; Robertson, Franklin; October 2007; 1 pp.; In English; Aura Science Team Meeting, 1-5 Oct. 2007, Pasadena, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Water vapor and ozone are the most important gases that regulate the radiative balance of the Tropical Tropopause Layer (TTL). Their radiative contribution dictates the height within the TTL and the rate at which air either ascends into the tropical stratosphere or subsides back to the tropical troposphere. The details of the mechanisms that control their concentration, however, are poorly understood. One of such mechanisms is convection that reaches into the TTL. In this study, we will present evidence from space-borne observations of the impact that convection has on water vapor, ozone, and temperature in the TTL over the Tropical Americas where deep and overshooting convection have the highest frequency of occurrence in the tropics. We explore the effect of convective systems such as hurricanes during the 2005 season using the Microwave Limb Sounder (MLS) on Aura version 1.5 data and more recent tropical systems using the newly released version 2 data with higher vertical resolution. In order to provide the horizontal extent and the vertical structure of the convective systems, we use data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on Aqua, the Microwave Humidity Sensor (MHS) on NOAA-18, and CloudSat when available.

Author

*Atmospheric Temperature; Tropical Regions; Troposphere; Convection; Water Vapor; Humidity*

**20080002356** Naval Postgraduate School, Monterey, CA USA

**Eastern North Carolina Marine Corps Forces and Installations High Intensity Hurricane Evacuation Decision Support**

Taylor, Brian; Jun 2007; 113 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473511; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473511>

Eastern North Carolina Marine Corps Forces and Installations (ENCMCFI) is located on the Atlantic coast of North Carolina and is therefore vulnerable to a major hurricane. Base commanders must weigh the substantial costs of evacuation approximately \$30-\$50M for a full evacuation against the risk posed by the effects of the storm if personnel are not evacuated. The purpose of this thesis is to provide a decision aid for base commanders to identify forecast conditions that indicate the need to initiate an evacuation. In order to assess the probability of a direct strike to ENCMCFI posed by a new storm, this thesis proposes using National Hurricane Center forecasts combined with a statistical model of historical forecast errors. Additionally an analysis of evacuation assets available and the distances to primary evacuation locations is also conducted to identify available options for evacuation at the decision time. A series of decision rules is created to determine whether, based on the current storm forecast and the available evacuation assets, evacuation is warranted now or whether it is better to wait until the next forecast is issued. The results of this study indicate that the risk of riding out the storm at ENCMCFI and the transportation risk of evacuating are approximately equal given the current evacuation plan and the required decision lead time.

DTIC

*Decision Support Systems; Forecasting; Hurricanes; North Carolina; Statistical Analysis*

**20080002392** World Meteorological Organization, Geneva, Switzerland

**JCOMM Expert Team on Sea Ice (ETSI), Third Session Steering Group for the Global Digital Sea Ice Data Bank (GDSIDB) Eleventh Session**

Mar 2007; 110 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): JCOMM-MR-51

Report No.(s): AD-A473566; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473566>

Table of Contents: General Summary of the work of the session; List of participants; Agenda; SPA top level objectives; Report by the chairperson of the expert team on Sea Ice (ETSI); Terms of reference of the task team on provision of MSI in polar regions; Report of the IMO/IHO/WMO Correspondence Group on Arctic MSI Services presented at the Eleventh Session of the IMO/COMSAR; Revised ETSI terms of reference; Marine information objects (MIO) - recommended procedures for development; Terms of reference of the task group on electronic navigational chart ice objects (TG ENCIO); Terms of reference of an expert on met-ocean information in graphical form; Proposed amendments to SIGRID-3 code; Recommendations for changes to ice coding and mapping standards; Vision and strategy for the standard for sea ice coding and presentation; New proposal for the MMMS questionnaire; Progress report on preparation of the International Polar Year 2007-2008; US Arctic Buoy programme; Terms of reference for the cross-cutting rapporteur on sea ice matters; Working plan for the next inter-sessional period; GCOS SST&SI working group activities on sea ice; Arctic marine shipping assessment (AMSA)- terms of reference; Work plan of the steering Group for the global digital sea ice data; Acronyms and other abbreviations.

DTIC

*Data Bases; Digital Data; Marine Meteorology; Sea Ice*

**20080002539** Library of Congress, Washington, DC USA

**Hurricanes Katrina and Rita and the Coastal Louisiana Ecosystem Restoration**

Zinn, Jeffrey; Sep 26, 2005; 7 pp.; In English

Report No.(s): AD-A473679; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hurricanes Katrina and Rita caused widespread damage and destruction to wetlands along the central Gulf Coast. Prior to these hurricanes, the U.S. Army Corps of Engineers had been seeking approval from the 109th Congress for a \$1.1 billion multiyear program to construct five projects that would help to restore portions of the coastal Louisiana ecosystem by slowing the rate of wetland loss and restoring some wetlands. This funding would also be used to continue planning several other related projects. The state of Louisiana and several federal agencies have participated in the development of this program. This report introduces this program, discusses whether it might have muted the impacts of a hurricane of the magnitude and paths of Katrina or Rita, and whether the devastation caused by both hurricanes might cause the Corps and other restoration supporters to propose either altering aspects of this proposed program, or expanding it. This report will be updated as more

information becomes available about either the storms effects on coastal Louisiana and its wetlands, or about any changes in the proposed program in response to these natural disasters.

DTIC

*Coasts; Ecosystems; Hurricanes; Restoration*

**20080002614** Army Engineer Research and Development Center, Vicksburg, MS USA

**Hurricane Barriers in New England and New Jersey - History and Status After Four Decades**

Morang, Andrew; Sep 2007; 116 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473784; ERDC/CHL-TR-07-11; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to renewed studies of potential hurricane barriers across Lake Pontchartrain, the U.S. Army Engineer Research and Development Center conducted a survey of the New England hurricane barriers. This survey revealed a number of common factors pertaining to the projects. First, most of the projects have not been tested with storm water elevations near their design elevation. An exception is the Charles River dam, which helped prevent flooding in Boston during the Blizzard of 1978. For the lower levels experienced, all projects performed as designed. Second, there is little information in the literature regarding flushing, sedimentation, or other environmental effects of the New England barriers. All except Charles River were constructed in an era when environmental studies were minimal compared to today. Third, long-term maintenance requirements were underestimated for the projects with mechanical components. In particular, the 1960s electromechanical controls at Providence and New Bedford need upgrading. Fourth, many people are unaware that the Corps of Engineers has built and efficiently operated hurricane barriers for more than 40 years. A public education campaign would be beneficial to the USACE. The New England and New Jersey barriers are excellent examples of cooperation and operational coordination between the USACE and municipal agencies. At least six major challenges will confront designers of Gulf Coast hurricane barriers compared to the earlier projects.

DTIC

*Flood Control; Hurricanes; New England (US)*

**20080002638** Center for Strategic and International Studies, Washington, DC USA

**The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change**

Campbell, Kurt M; Gullede, Jay; McNeill, J R; Podesta, John; Ogden, Peter; Fuerth, Leon; Woolsey, R J; Lennon, Alexander T; Smith, Julianne; Weitz, Richard; Nov 2007; 125 pp.; In English

Report No.(s): AD-A473826; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although the consequences of global climate change may seem to be the stuff of Hollywood--some imagined, dystopian future--the melting ice of the Arctic, the spreading deserts of Africa, and the swamping of low lying lands are all too real. We already live in an 'age of consequences,' one that will increasingly be defined by the intersection of climate change and the security of nations. For the past year a diverse group of experts, under the direction and leadership of the Center for Strategic and International Studies (CSIS) and the Center for a New American Security (CNAS), met regularly to start a new conversation to consider the potential future foreign policy and national security implications of climate change. The group consisted of nationally recognized leaders in the fields of climate science, foreign policy, political science, oceanography, history, and national security.

DTIC

*Climate; Climate Change; Climatology; Foreign Policy; Security*

**20080002889** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Lightning: Nature's Probe of Severe Weather for Research and Operations**

October 13, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Lightning, the energetic and broadband electrical discharge produced by thunderstorms, provides a natural remote sensing signal for the study of severe storms and related phenomena on global, regional and local scales. Using this strong signal- one of nature's own probes of severe weather -lightning measurements prove to be straightforward and take advantage of a variety of measurement techniques that have advanced considerably in recent years. We briefly review some of the leading lightning detection systems including satellite-based optical detectors such as the Lightning Imaging Sensor, and ground-based radio frequency systems such as Vaisala's National Lightning Detection Network (NLDN), long range lightning detection systems, and the Lightning Mapping Array (LMA) networks. In addition, we examine some of the exciting new research results and operational capabilities (e.g., shortened tornado warning lead times) derived from these observations. Finally we look forward

to the next measurement advance - lightning observations from geostationary orbit.

Author

*Lightning; Storms (Meteorology); Remote Sensing; Optical Measuring Instruments; Thunderstorms; Imaging Techniques*

**20080002907** Colorado State Univ., Fort Collins, CO, USA

**CIRA: Cooperative Institute for Research in the Atmosphere Newsletter, Volume 27, Spring 2007**

McInnis-Efaw, Mary, Editor; Grames, Laura, Editor; March 2007; 29 pp.; In English; See also 20080002908 - 20080002912; Original contains color illustrations; Copyright; Avail.: Other Sources

Topics covered include: CIRA Participation in the 2007-2008 International Polar Year; CIRA Contributes to the Hydrometeorological Testbed; The Western Regional Air Partnership Technical Support System; The Volcanic Ash Coordination Tool (VACT) Project; and The GOES-13 Science Test.

Derived from text

*Hydrometeorology; GOES 13; Support Systems; Volcanoes*

**20080002908** Colorado State Univ., Fort Collins, CO, USA

**The Volcanic Ash Coordination Tool (VACT) Project**

Frimel, Jim; Matsumoto, Cliff; CIRA: Cooperative Institute for Research in the Atmosphere Newsletter, Volume 27, Spring 2007; March 2007, pp. 18-22; In English; See also [20080002907](#); Copyright; Avail.: Other Sources

After the 2001 eruption of Mt. Cleveland in the Aleutian Islands of Alaska, inconsistent weather advisory products were generated for the adjacent Flight Information Regions. In response, NOAA's Earth System Research Lab/Global Systems Division (ESWGS) and CIRA engineers have been researching collaborative approaches for generating Volcanic Ash Advisories at the Anchorage Volcanic Ash Advisory Center (VAAC), Alaska Volcano Observatory (AVO), and Anchorage Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU). The Volcanic Ash Coordination Tool (VACT) is under development and will be deployed at each of these operational units to simultaneously view identical displays and collaborate weather information in near real-time to help create a suite of fully consistent advisories and forecasts for volcanic ash. The VACT project is a research and development effort in direct response to investigating the collaborative approaches and needs of agencies involved in generating Volcanic Ash Advisories. The system is designed to help locate and determine the extent and movement of volcanic ash so that more accurate, timely, consistent, and relevant ash dispersion and ash fallout watches, warnings, and forecasts can be issued. Efforts are focused on integrating the latest advancements in volcanic ash detection and dispersion from the research community and allowing users to overlay and manipulate this information in real-time; developing tools to generate end user impact statements and graphics; and disseminating the impact statements in a timely fashion so that hazard mitigation plans can be activated.

Derived from text

*Ashes; Weather; Volcanic Eruptions; Earth Sciences*

**20080002909** Colorado State Univ., Fort Collins, CO, USA

**The GOES-13 Science Test**

Hillger, Don; CIRA: Cooperative Institute for Research in the Atmosphere Newsletter, Volume 27, Spring 2007; March 2007, pp. 24-25; In English; See also [20080002907](#); Copyright; Avail.: Other Sources

The latest Geostationary Operational Environmental Satellite (GOES), GOES-N, was launched on 24 May 2006, and reached geostationary orbit at 89.5 deg. W on 4 June 2006 to become GOES-13. It was later moved to 105 deg. W for the Science Test and eventual storage. GOES-13 has Imager and Sounder instruments similar to those on GOES-8/12, but is on a different spacecraft bus. The new bus for GOES-N/O/P allows improvements both to image navigation and registration, as well as the radiometrics. Also, by supplying data through the eclipse, when the satellite passes into the shadow of the earth, the GOES-N/O/P system addresses related outages during eclipses in both the spring and fall seasons. Operation through eclipse is now possible due to larger spacecraft batteries.

Derived from text

*GOES 13; Infrared Imagery; Meteorology; Imaging Techniques*

**20080002910** Colorado State Univ., Fort Collins, CO, USA

**CIRA Contributes to the Hydrometeorological Testbed**

Albers, Steve; Anderson, Chris; Jankov, Isidora; Szoke, Ed; CIRA: Cooperative Institute for Research in the Atmosphere Newsletter, Volume 27, Spring 2007; March 2007, pp. 6-11; In English; See also [20080002907](#); Copyright; Avail.: Other Sources

The Hydrometeorological Testbed (HMT) is a well-funded, multi-year project (<http://hmt.noaa.gov/>) designed to improve



the use of research quality observations and modeling in operational forecasts of precipitation and streamflow. The first large field campaign was held December 2005 to March 2006 in the American River Basin (ARB) of the Central Sierra Mountains. CIRA researchers in the Forecast Applications Branch (FAB) are in integral part of ESRL/Global Systems Division's effort to provide high-resolution model analyses and forecasts in support of field operations and NWS operational forecasting.

Derived from text

*Hydrometeorology; River Basins; Numerical Weather Forecasting; Remote Sensing*

**20080002911** Colorado State Univ., Fort Collins, CO, USA

**The Western Regional Air Partnership Technical Support System**

Moore, Tom; McClure, Shawn; Fox, Doug; CIRA: Cooperative Institute for Research in the Atmosphere Newsletter, Volume 27, Spring 2007; March 2007, pp. 12-14; In English; See also [20080002907](#); Copyright; Avail.: Other Sources

The Western Regional Air Partnership (WRAP) represents a history of over 15 years of collaboration on technical aspects of western air quality, specifically for analyses supporting the U.S. Environmental Protection Agency (EPA) regional haze regulations. This body of work representing well over \$20 million of federal investment in data and analysis tools underpinned by robust participation and in-kind support by States, Tribes, Federal agencies, as well as the environmental and the industrial communities. This support has established a broad basis for developing a regional understanding of air quality and future related challenges in environmental health, ecological and aesthetic protection of our natural areas and, of course, coping with a changing climate.

Derived from text

*Air Quality; Support Systems; Climate Change; Regions; Environment Protection*

**20080002912** IPY International Programme Office, Cambridge, UK

**CIRA Participation in the 2007-2008 International Polar Year**

Liston, Glen E.; CIRA: Cooperative Institute for Research in the Atmosphere Newsletter, Volume 27, Spring 2007; March 2007, pp. 1-5; In English; See also [20080002907](#); Copyright; Avail.: Other Sources

The International Polar Year (IPY) is a large scientific program focused on the Arctic and Antarctic from March 2007 to March 2009. IPY, organized through the International Council for Science (ICSU) and the World Meteorological Organization (WMO), is actually the fourth polar year, following those in 1882-3, 1932-3, and 1957-8. In order to have full and equal coverage of both the Arctic and the Antarctic, IPY 2007-8 covers two full annual cycles. From March 2007 to March 2009 and will involve over 201 projects, with thousands of scientists from over 60 nations examining a wide range of physical, biological, and social research topics. It is also an unprecedented opportunity to demonstrate, follow, and get involved with cutting edge science in real-time.

Derived from text

*Antarctic Regions; Arctic Regions; World Meteorological Organization; International Cooperation; Geophysics*

**20080012183**

**MISR Level 2 TOA/Cloud Stereo parameters V002**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center

ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCST\\_V2](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCST_V2)

The MISR Top-of-Atmosphere (TOA)/Cloud Stereo geophysical parameters include stereoscopically-derived cloud motion vectors (winds), cloud-top heights, and an accompanying cloud mask. The Stereo product geophysical parameters include a stereoscopically-derived cloud mask and cloud height on a 1.1 km grid. It also includes cloud motion vectors on a 70.4 km grid. The three types of stereo heights are: the BestWind heights are only calculated for those regions where the associated wind vectors passed the quality tests. Therefore, they have sparse coverage but since the wind correction is included, these contain our 'best guess' as to what the true heights are. The WithoutWind heights are calculated assuming a constant wind vector of zero. They have almost complete coverage and therefore form a nice 'pretty picture' of the relative cloud heights over small areas. The RawWind heights are a diagnostic product as they are calculated using all available wind vectors (even the bad ones). It is therefore recommended that one only use the Best and Without wind products. It is important to remember that the stereo matchers pick up the layer of maximum contrast, which is not necessarily the same as the highest cloud so all the stereo heights are keyed to this level of maximum contrast. Therefore, higher and thinner cirrus layers may not be detected by any of the height fields. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180]

[Data\_Resolution: Latitude\_Resolution=1.1 km; Longitude\_Resolution=1.1 km; Temporal\_Resolution=about 15 orbits/day].  
NASA  
*Clouds (Meteorology); Cloud Cover*

#### **20080012184**

##### **MISR Level 2 TOA/Cloud Classifier parameters V003**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCCL\\_V3](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIL2TCCL_V3)

The TOA/Cloud Classifiers contain the Angular Signature Cloud Mask (ASCM), a scene classifier calculated using support vector machine technology (SVM) both of which are on a 1.1 km grid, and cloud fractions at 17.6 km resolution that are available in different height bins (low, middle, high) and are also calculated on an angle-by-angle basis. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180] [Data\_Resolution: Latitude\_Resolution=1.1 km; Longitude\_Resolution=1.1 km; Temporal\_Resolution=about 15 orbits/day].  
NASA

*Clouds (Meteorology); Cloud Cover*

#### **20080012187**

##### **MISR radiometric camera-by-camera Cloud Mask V004**

[Data Set]

Diner, David J., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: [http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIRCCM\\_V4](http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:MISR:MIRCCM_V4)

The MISR instrument consists of nine pushbroom cameras which measure radiance in four spectral bands. Global coverage is achieved in nine days. The cameras are arranged with one camera pointing toward the nadir, four cameras pointing forward and four cameras pointing aftward. It takes 7 minutes for all nine cameras to view the same surface location. The view angles relative to the surface reference ellipsoid, are 0, 26.1, 45.6, 60.0, and 70.5 degrees. The spectral band shapes are nominally gaussian, centered at 443, 555, 670, and 865 nm. The RCCM is derived from the radiance values, and is calculated independently for each camera. Therefore, the amount of apparent cloudiness will vary with view angle, with the oblique view angles generally being more cloudy than the near-nadir ones. Since the RCCM is calculated primarily from the radiance values, it does not work well over snow and ice and will usually confuse clear snow/ice with cloud. It works the best over clear-sky ocean, but other surface types are also of quite good quality. The RCCM product also contains a glint mask for each camera, and this mask is set to true whenever the scattering angles indicate that glint could be possible. This glint mask is not masked out over land; users must do this step themselves. [Temporal\_Coverage: Start\_Date=2000-02-24; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*Clouds (Meteorology); Cloud Cover*

#### **20080012202**

##### **International Satellite Cloud Climatology Project**

[Data Set (Project Description)]

Rossow, William B., Principal Investigator; No Copyright; Avail.: Atmospheric Science Data Center  
ONLINE: <http://pmh-prod.larc.nasa.gov:8080/info?id=oai:asdc.larc.nasa.gov:ISCCP>

The International Satellite Cloud Climatology Project (ISCCP) was established as the first project of the World Climate Research Programme (WCP-2) to collect and analyze satellite radiance measurements to infer the global distribution of cloud radiative properties and their diurnal and seasonal variations. The operational phase of ISCCP began in July 1983 and is currently planned to continue through June 2010. [Mission Objectives] To produce a global, reduced resolution, infrared and visible, calibrated and normalized radiance data set containing basic information on the radiative properties of the atmosphere from which cloud parameters can be derived. To stimulate and coordinate basic research on techniques for inferring the physical properties of clouds from the condensed radiance data set and to apply the resulting algorithms to derive and validate a global cloud climatology for improving the parameterization of clouds in climate models. To promote research using ISCCP data and contributing to improved understanding of the Earth's radiation budget (top of the atmosphere and surface) and

hydrological cycle. [Temporal\_Coverage: Start\_Date=1983-07-01; Stop\_Date=] [Spatial\_Coverage: Southernmost\_Latitude=-90; Northernmost\_Latitude=90; Westernmost\_Longitude=-180; Easternmost\_Longitude=180].

NASA

*ISCCP Project; Satellite Observation; Climatology; Clouds (Meteorology); Remote Sensing*

## 51

### LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

**20080000352** Virginia Univ., Charlottesville, VA USA

#### **Preclinical Evaluation of Serine/Threonine Kinase Inhibitors Against Prostate Cancer Metastases**

Guise, Theresa; Nov 2006; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0920

Report No.(s): AD-A472120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472120>

A central tenet of the field of bone metastases is that the bone microenvironment supplies factors, such as TGF-beta, stimulating prostate cancer cell signaling and altering their phenotype. TGF-beta signaling in cancer is however complex and can lead to the activation of numerous genes. We have identified many of these genes by microarray analysis and have validated the gene reported here. Of these, PMEPA1 as the most highly upregulated gene. We have cloned the PMEPA1 promoter and full-length gene and have begun promoter analysis of the TGFbetabetaresponse element. We are in the process of overexpressing PMEPA1 in prostate cancer lines. In vivo experiments are in progress to determine the effect of a TGFbeta RI kinase inhibitor, SD-208, on the development and progression of prostate cancer metastases to bone due to PC-3, LuCAP and C42B prostate cancers.

DTIC

*Amino Acids; Bones; Cancer; Enzyme Activity; Enzymes; Metastasis; Phosphorus; Prostate Gland*

**20080000353** Rochester Univ., NY USA

#### **To Investigate the Therapeutic Effects of the COX-2 Inhibitor NS-398 as a Single Agent, and in Combination with Vitamin D, in Vitro and in Vivo**

Lee, Yi-Fen; Jan 2007; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0121

Report No.(s): AD-A472121; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472121>

The incidence of prostate cancer has increased and effort is needed towards understanding mechanisms involved in development/progression of prostate cancer and developing new strategies for prevention/treatment. Studies suggested nonsteroidal anti-inflammatory drugs, such as COX-2 inhibitor, act as chemopreventative agents and found COX-2 expression in prostate cancer correlated with cancer progression. Treatment of prostate cancer cells with COX-2 inhibitor, NS-398, induces VDR expression, and might increase vitamin D sensitivity. Treatment of prostate cancer cells with 1,25-VD results in reduced COX- 2 expression. Based on the bi-directional regulation of vitamin D and COX-2 inhibitor, we hypothesize that combining vitamin D and COX-2 inhibitor in treatment of prostate cancer will be beneficial. Over the past year, we identified the molecular mechanism by which vitamin D inhibits prostate cancer angiogenesis through IL-8, finding a strong correlation of IL-8 expression with prostate cancer disease progression, therefore, inhibition of IL-8 by vitamin D supports the chemotherapeutic effects of vitamin D in preventing prostate cancer progression. The clinical use of COX-2 inhibitors has recently become controversial due to cardiovascular complications associated with the use of COX-2 inhibitor for prolonged periods of time. Therefore in addition to combination with COX-2 inhibitor, vitamin D-based combination therapy was developed. Docetaxel is the only treatment shown to improve overall survival in hormonal refractory prostate cancer patients; however the survival benefit is modest. Treatment with docetaxel in combination with vitamin D has shown promising results in prostate specific antigen response, time to progression and survival in HRPc patients. Detailed mechanism of this combination therapy was studied to provide a further therapeutic design.

DTIC

*Angiogenesis; Calciferol; Cancer; Chemotherapy; Health; In Vitro Methods and Tests; In Vivo Methods and Tests; Inhibitors; Prostate Gland; Therapy*

**2008000354** Stanford Univ., Stanford, CA USA

**The Role of Vitamin D Stimulation of Mullerian Inhibiting Substance (MIS) in Prostate Cancer Therapy**

Feldman, David; Dec 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0179

Report No.(s): AD-A472122; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472122>

We propose that MIS regulation may be an important element contributing to the ability of 1,25-dihydroxyvitamin D<sub>3</sub> (calcitriol) to inhibit the growth and progression of prostate cancer cells. We have shown that calcitriol acts by several pathways to inhibit the growth of prostate cancer cells [1-5]. In the current studies we show that calcitriol also stimulates the expression of MIS in a standard human prostate cancer cell line, LNCaP. We further show that the up-regulation of MIS expression is mediated directly by calcitriol binding to the vitamin D receptor (VDR) and the complex subsequently interacting with a vitamin D regulatory element (VDRE) in the MIS gene promoter.

DTIC

*Calciferol; Cancer; Prostate Gland; Stimulation; Therapy*

**2008000355** Jackson (Henry M.) Foundation, Rockville, MD USA

**Molecular Biology and Prevention of Endometrial Cancer**

Maxwell, George L; Jul 1, 2007; 45 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0183

Report No.(s): AD-A472123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472123>

To increase our understanding of the molecular aberrations associated with endometrial carcinogenesis and the biological mechanisms underlying the protective effect of oral contraceptive (OC) therapy.

DTIC

*Cancer; Molecular Biology; Prevention; Tumors*

**2008000356** Scripps Research Inst., La Jolla, CA USA

**Homeostatic T Cell Expansion to Induce Anti-Tumor Autoimmunity in Breast Cancer**

Baccala, Roberto; Apr 1, 2007; 21 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0454

Report No.(s): AD-A472124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472124>

We have previously shown that effective anti-tumor autoimmunity can be induced if a tumor-cell challenge is given to mice undergoing homeostatic T-cell proliferation, a process dependent on signaling by self-peptide/MHC and trophic cytokines. We investigated whether this principle can be applied to mouse models of advanced breast carcinoma, and whether the anti-tumor response can be enhanced using selected T-cell subpopulations, cytokines and tumorvaccines. The results indicated that (a) homeostatic T-cell proliferation consistently elicits anti-tumor responses; (b) irradiation is more effective than T-cell depletion by antibodies in inducing anti-tumor responses mediated by homeostatic T-cell proliferation; however, irradiation (and/or the resulting lymphopenic state) may facilitate metastasis dissemination; (c) the frequency of T regulatory (Treg) cells increases during homeostatic proliferation, particularly in the presence of a growing tumor; in vivo depletion of Treg cells enhances the anti-tumor effect of homeostatic T-cell proliferation on subcutaneous breast carcinoma; (d) gamma/delta T cells, a lymphocyte subpopulation with significant anti-tumor activity, can be induced to undergo homeostatic proliferation, and this requires depletion of both alpha/beta and gamma/delta T cell compartments and availability of either IL-7 or IL-15; (e) the anti-tumor response is diminished in aged mice, and this correlates with inefficient homeostatic T-cell proliferation; this defect can however be corrected by provision of the trophic cytokine IL-7; (f) IL-7 complexed with anti-IL-7 antibodies and/or IL-2 complexed with anti-IL-2 antibodies induce T cell proliferation in both lymphopenic and non-lymphopenic mice; (g) in non-lymphopenic mice, IL-7/antibody and particularly IL-2/antibody complexes induce cytotoxic effector functions in CD8 T cells, and inhibit tumor growth, metastasis and mortality in a model of breast carcinoma;

DTIC

*Breast; Cancer; Homeostasis; Immunity; Lymphocytes; Mammary Glands; Tumors*

**2008000357** Northern California Cancer Center, Fremont, CA USA

**The Hygiene Hypothesis and Breast Cancer a Novel Application of an Etiologic Theory for Allergies, Asthma, and Other Immune Disorders**

Clarke, Christina A; May 2007; 63 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0283

Report No.(s): AD-A472125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472125>

The hygiene hypothesis, the idea that reduced exposure to important microbes, especially in childhood, impacts development of asthma and allergies, may have application to breast cancer. This research project aims to explore the hygiene hypothesis as it might relate to breast cancer development, thereby assessing its utility for more comprehensive future research. This research project is aiming to interview a population-based series of 500 Californian women recently diagnosed with breast cancer and 500 healthy control women as regards age-specific experiences relevant to microbial exposures. This project is currently at the end of Year 2. To date, we have interviewed over 350 study subjects and initiated new control ascertainment procedures using mailing list sampling methods. 8% of the 694 breast cancer cases identified as potentially eligible by the cancer registry were determined to be ineligible on the basis of vital status, language preference, or other factors. Preliminary estimates of participation rates are substantially lower than anticipated, with 54% of eligible cases interviewed, but 15% irrevocably refusing to participate and other cases soft-refusing or in process of being located or contacted. Data collection efforts are ongoing.

DTIC

*Allergic Diseases; Asthma; Breast; Cancer; Etiology; Exposure; Hygiene; Hypotheses; Immunity; Mammary Glands*

**2008000358** Brown Univ., Providence, RI USA

**High Resolution X-Ray Phase Contrast Imaging with Acoustic Tissue-Selective Contrast Enhancement**

Diebold, Gerald J; Jun 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0481

Report No.(s): AD-A472126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472126>

We show that laser-driven thermal modification can be used to selectively enhance regions of a flowing carbon suspension. The preliminary proof-of-principle experiments illustrate the ability to measure thermal modifications in a time-resolved manner utilizing x-ray phase-contrast imaging paving the way for implementation in a biological model. Additional results of biological tissue sample measurements are presented. X-ray phase-contrast images of murine hepatic and pulmonary samples reveal fine structure usually visible only by utilizing histological or microscopy techniques. The method holds promise for future applications to study murine models of pulmonary and hepatic disease.

DTIC

*Augmentation; High Resolution; Images; Phase Contrast; X Ray Imagery; X Rays*

**2008000372** Johns Hopkins Univ., Baltimore, MD USA

**Fatty Acid Synthase Inhibitor Cytotoxicity: Depletion of the Coenzyme-A Pool. Revision**

Kuhajda, Francis P; Apr 2005; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0431

Report No.(s): AD-A472164; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472164>

Inhibition of fatty acid synthase (FAS) with C75 in human cancer cells leads to cytotoxicity without evidence of DNA damage. Based on this and other biochemical observations attention was focused on the cytoplasm as the site for the origin of C75 cytotoxicity to human cancer cells. We have shown that eukaryotic initiation factor 2 alpha (EIF2alpha), a key regulator of protein synthesis and the ER stress response is involved in the cytotoxic mechanism of C75 against human breast cancer cells. Based on these observations we synthesized a series of novel thiazolidinedione (TZD) compounds. TZD's likely induce cancer cell death through inhibition of translation initiation mediated by phosphorylation of eukaryotic initiation factor 20 (EIF2alpha) rendering it inactive. In summary our novel TZD are cytotoxic to human colon cancer cells in vitro and xenografts in athymic mice. These compounds also phosphorylate EIF2alpha similar to C75. Based on these observations novel class of potent TZD derivatives which may be useful for the treatment of a wide variety of human cancers.

DTIC

*Breast; Cancer; Coenzymes; Depletion; Fatty Acids; Inhibitors; Mammary Glands; Weight Reduction*

**20080000384** Toledo Health Sciences Campus, Toledo, OH USA

**Functional Analysis of the Beclin-1 Tumor Suppressor Interaction with hVps34 (Type-III PI3'-kinase) in Breast Cancer Cells**

Maltese, William A; Jun 2007; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0493

Report No.(s): AD-A472188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472188>

Macroautophagy is associated with type II programmed cell death. Beclin 1 regulates macroautophagy. Overexpression of Beclin promotes autophagy and inhibits tumorigenesis in breast carcinoma cells, and conversely, heterozygous disruption of the Beclin gene can promote tumorigenesis in mice. In Year-1 we established that Beclin associates with the human type-III phosphatidylinositol 3-kinase (PI3K), hVps34, but not with another putative partner, Bcl-2. The lipid product of Vps34, PI(3)P, is required not only for autophagy, but also for assembly of proteins involved in endocytosis and trafficking of enzymes from the trans-Golgi network to the lysosomes. Our studies indicated that Beclin is required for hVps34 to function in autophagy, but is dispensable for hVps34 to function in endocytosis. In Year-2 we have generated a stable MCF7 breast cancer cell line with expression of FLAG-tagged Beclin under the control of an inducible promoter. Using this cell line, we purified the FLAG-Beclin-Vps34 complex and performed mass spectrometry to identify other protein components present in the complex. We established for the first time that p150, a regulatory subunit of type-III PI3K, associates with Beclin. We generated a Beclin mutant that fails to associate with p150, but remains competent to interact with Vps34. In Year-3 we have generated valuable MCF7 breast cancer cell lines that are essentially deficient in expression of both Beclin-1 and p150. We have also determined that increased autophagy precedes apoptosis in MCF7 cells treated with tamoxifen. Using the Beclin and p150 knockdown cells, we will now extend our studies to determine definitively if autophagy is a protective mechanism or a cause of cell death.

DTIC

*Breast; Cancer; Functional Analysis; Mammary Glands; Suppressors; Tumors*

**20080000392** Yale Univ., New Haven, CT USA

**Comparing Genomes in Terms of Protein Structure: Surveys of a Finite Parts List**

Gerstein, Mark; Hegyi, Hedi; Jan 1998; 45 pp.; In English

Contract(s)/Grant(s): N00014-97-1-0725

Report No.(s): AD-A472206; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472206>

We give an overview of the emerging field of structural genomics, describing how genomes can be compared in terms of protein structure. As the number of genes in a genome and the total number of protein folds are both quite limited, these comparisons take the form of surveys of a finite parts list, similar in respects to demographic censuses. Fold surveys have many similarities with other whole-genome characterizations, e.g. analyses of motifs or pathways. However, structure has a number of aspects that make it particularly suitable for comparing genomes, namely the way it allows for the precise definition of a basic protein module and the fact that it has a better defined relationship to sequence similarity than does protein function. An essential requirement for a structure survey is a library of folds, which groups the known structures into 'fold families.' This library can be built up automatically using a structure-comparison program, and we described how important objective statistical measures are for assessing similarities within the library and between the library and genome sequences. After building the library, one can use it to count the number of folds in genomes, expressing the results in the form of Venn diagrams and 'top-10' statistics for shared and common folds. Depending on the counting methodology employed, these statistics can reflect different aspects of the genome, such as the amount of internal duplication or gene expression. Previous analyses have shown that the common folds shared between very different microorganisms - i.e. in different kingdoms - have a remarkably similar structure, being comprised of repeated strand-helix-strand super-secondary structure units. A major difficulty with this sort of 'fold-counting' is that only a small subset of the structures in a complete genome are currently known and this subset is prone to sample bias.

DTIC

*Counting; Genome; Lists; Proteins; Surveys*

**20080000394** Yale Univ., New Haven, CT USA

**The Relationship between Protein Structure and Function: a Comprehensive Survey with Application to the Yeast Genome**

Hegyí, Hedi; Gerstein, Mark; Jan 1999; 47 pp.; In English

Contract(s)/Grant(s): N00014-97-1-0725

Report No.(s): AD-A472211; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472211>

For most proteins in the genome databases, function is predicted via sequence comparison. In spite of the popularity of this approach, the extent to which it can be reliably applied is unknown. We address this issue by systematically investigating the relationship between protein function and structure. We focus initially on enzymes classified by the Enzyme Commission (EC) and relate these to structurally classified proteins in the SCOP database. We find that the major SCOP fold classes have different propensities to carry out certain broad categories of functions. For instance alpha/beta folds are disproportionately associated with enzymes, especially transferases and hydrolases, and all-alpha and small folds with non-enzymes, while alpha+beta folds have an equal tendency either way. These observations for the database overall are largely true for specific genomes. We focus, in particular, on yeast, analyzing it with many classifications in addition to SCOP and EC (i.e. COGs, CATH, MIPS), and find clear tendencies for fold-function association, across a broad spectrum of functions. Analysis with the COGs scheme also suggests that the functions of the most ancient proteins are more evenly distributed among different structural classes than those of more modern ones. For the database overall, we identify both most versatile functions, i.e. those that are associated with the most folds, and most versatile folds, associated with the most functions. The two most versatile enzymatic functions (hydro-lvases and O-glycosyl glucosidases) are associated with 7 folds each. The five most versatile folds (TIM-barrel, Rossmann, ferredoxin, alpha-beta hydrolase, and P-loop NTP hydrolase) are all mixed alpha-beta structures. They stand out as generic scaffolds, accommodating from 6 to as many as 16 functions (for the exceptional TIM-barrel).

DTIC

*Genome; Proteins; Sequencing; Surveys; Yeast*

**20080000402** Yale Univ., New Haven, CT USA

**The Relationship Between Protein Structure and Function: A Comprehensive Survey Focusing on Enzymes**

Hegyí, Hedi; Gerstein, Mark; Jan 1999; 20 pp.; In English

Contract(s)/Grant(s): N00014-97-1-0725

Report No.(s): AD-A472224; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472224>

For most proteins in the genome databases, function is predicted via sequence comparison. In spite of the popularity of this approach, the extent to which it can be reliably applied is unknown. We address this issue by systematically investigating the relationship between protein function and structure. We focus initially on enzymes classified by the Enzyme Commission (EC) and relate these to structurally classified proteins in the SCOP database. We find that the major SCOP fold classes have different propensities to carry out certain broad categories of functions. For instance, alpha/beta folds are disproportionately associated with enzymes, especially transferases and hydrolases, and all-alpha and small folds with non-enzymes, while alpha + beta folds have an equal tendency either way. These observations for the database overall are largely true for specific genomes. We focus, in particular, on yeast, analyzing it with many classifications in addition to SCOP and EC (i.e. COGs, CATH, MIPS), and find clear tendencies for fold-function association, across a broad spectrum of functions. Analysis with the COGs scheme also suggests that the functions of the most ancient proteins are more evenly distributed among different structural classes than those of more modern ones. For the database overall, we identify the most versatile functions, i.e. those that are associated with the most folds, and the most versatile folds, associated with the most functions. The two most versatile enzymatic functions (hydro-lvases and O-glycosyl glucosidases) are associated with seven folds each. The ve most versatile folds (TIM-barrel, Rossmann, ferredoxin, alpha-beta hydrolase, and P-loop NTP hydrolase) are all mixed alpha-beta structures. They stand out as generic scaffolds, accommodating from six to as many as 16 functions (for the exceptional TIM-barrel).

DTIC

*Enzymes; Proteins; Surveys*

**2008000435** General Accounting Office, Washington, DC USA

**Defense Health Care: Issues Related to Past Drinking Water Contamination at Marine Corps Base Camp Lejeune**

Jun 12, 2007; 40 pp.; In English

Report No.(s): AD-A472289; GAO-07-933T; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472289>

In the early 1980s, volatile organic compounds (VOC) were discovered in some of the water systems serving housing areas on Marine Corps Base Camp Lejeune. Exposure to certain VOCs may cause adverse health effects, including cancer. Since 1991, the Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) has been examining whether individuals who were exposed to the contaminated drinking water are likely to have adverse health effects. ATSDR's current study is examining whether individuals who were exposed in utero are more likely to have developed certain childhood cancers or birth defects.

DTIC

*Contamination; Health; Potable Water*

**2008000558** Louisiana State Univ., New Orleans, LA USA

**Interfering with DNA Damage Signals: Radiosensitizing Prostate Cancer using Small Peptides**

Xu, Bo; Nov 2006; 6 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0018

Report No.(s): AD-A472316; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our focus of this project is to characterize a newly developed small peptide on its ability to function as a powerful radiosensitizer. Radio sensitivity is mainly controlled by a kinase named ATM and its phosphorylation of downstream targets, including Structural Maintenance of Chromosomal protein on (SMC1). Previously we have demonstrated that small fusion peptides containing SMC1 phosphorylation sequences can inhibit ATM activity. We have characterized the inhibitory effect of the THM-SMC1 peptide on cellular response to radiation and found the peptide can abolish radiation induced S- phase checkpoint and decrease prostate tumor cell clonogenic survival. During the last performance period, we further performed experiments focusing of the magnitude of peptide sensitization and the effect on the other cell cycle checkpoints. We have demonstrated the wild type SMC1 peptide linked with a tumor homing motif can significantly increase prostate tumor radiosensitivity. Future experiments will be focusing on mechanisms and the in vivo activity of the peptides.

DTIC

*Cancer; Damage; Deoxyribonucleic Acid; Peptides; Prostate Gland; Radiation Tolerance*

**2008000559** Southwest Louisiana Healthcare System, Lake Charles, LA USA

**Community Hospital Telehealth Consortium**

Williams, Jr, Elton L; Apr 2007; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-C-0078

Report No.(s): AD-A472317; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Community Hospital Telehealth Consortium is a unique, forward-thinking, community-based healthcare service project organized around 5 not-for-profit community hospitals located throughout Louisiana and Mississippi. The central tenet of the CHTC project is the utilization of TeleHealth technology to improve and expand the opportunity for rural and urban underserved populations to receive quality, affordable health care. The CHTC's goals are to improve quality of and access to health care, to reduce system costs without jeopardizing outcomes, to position Louisiana and Mississippi for the emerging domestic marketplace, and to position Louisiana and Mississippi for the international marketplace. Considerable progress was made throughout the project period through our Telemedicine Clinics, our Home Health Telehealth initiatives, and our distance learning initiatives.

DTIC

*Hospitals; Management Systems; Medical Services; Organizations; Telemedicine*

**2008000560** Georgetown Univ., Washington, DC USA

**Impact of Culture on Breast Cancer Screening in Chinese American Women**

Wang, Judy H; Sep 2006; 104 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0390

Report No.(s): AD-A472318; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study is to develop and use culturally appropriate and stage-tailored Chinese language breast cancer



brochures to promote older Chinese American women's intentions to obtain mammography. A three-year research plan is designed to pursue this purpose. In Year 1, the brochures were developed and refined based on previous finding of cultural and language barriers to breast cancer screening in Chinese women. In Year 2, two hundred and fifty Chinese women aged 50 and older in the Washington, DC area completed a telephone interview regarding their previous screening experience, cultural views and screening barriers. Participants were randomly assigned to either an intervention group with stage-tailored brochures or a control group with standard brochures. In Year 3, we mailed the appropriate set of materials to participants and conducted process and outcome evaluations of the intervention materials. In a no cost extension period, Year 4, we completed the followup assessment and conducted data analyses. Cultural and language barriers were associated with the regular use of mammography. Participants increased their intentions to obtain a mammogram after the brochure intervention. The PI has strengthened her expertise in cancer prevention research throughout the course of this project and advanced her professional development by receiving new funding and applying for faculty promotion.

DTIC

*Breast; Cancer; China; Females; Mammary Glands*

**20080000566** Louisiana State Univ., New Orleans, LA USA

**Alcohol Intoxication Impact on Outcome from Traumatic Injury**

Molina, Patricia E; May 2007; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0236

Report No.(s): AD-A472329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The incidence of traumatic injury in alcohol-intoxicated individuals has continued to escalate during recent years. Traumatic injury is responsible for the greatest number of years of potential life lost before age 65; higher than that attributed to cancer, heart disease and HIV. Approximately 25% of injuries treated in emergency departments are alcohol related. Alcohol-intoxicated injured victims are likelier to present with more severe injury. Although improved resuscitation of trauma patients has dramatically reduced immediate death from hemorrhagic shock, the outcome of these patients continues to be complicated with infections and secondary loss of organ function during the recovery period. Frequently patients have to go through surgical procedures to stabilize them or save their lives. These additional invasive procedures add to the risk of complications in the victims of traumatic injury. We have obtained data from our studies showing that alcohol-intoxication interferes with the body's response to loss of blood and in addition, interferes with the restoration of blood pressure with intravenous fluid resuscitation. In addition, we have also observed that the mortality following traumatic injury in the intoxicated host leads to greater mortality from infection. One of the possible aspects that may be affected by alcohol is the brain's ability to adequately activate all of the responses that are necessary to control blood pressure and to ensure that blood flow and oxygen reach all the tissues. Our studies investigate the pathways that alcohol affects leading to inability to restore blood pressure. The studies use an animal model to investigate what are the brain responses that alcohol affects and to see whether restoring these responses will aid in recovery from hemorrhagic shock.

DTIC

*Alcohols; Injuries; Intoxication*

**20080000567** Kimmel (Sidney) Cancer Center, San Diego, CA USA

**Elucidating the Role of Cks Proteins in Breast Cancer by Combining the Disciplines of Molecular Biology, Pathology, and Biophysics**

del Rincon, Sonia; Mar 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0344

Report No.(s): AD-A472330; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Breast cancer often occurs when the proteins that regulate normal epithelial cell division become dysregulated. This proposal examines the role of the cell cycle regulatory proteins, human cyclin-dependent kinase subunits (Cks1 and Cks2) in human breast cancer. The overexpression of Cks genes in breast tumor tissue and the role of Skp2 in tumorigenesis, suggests that Cks and Skp2 levels must be strictly regulated for proper cell cycling. We hypothesize that aberrant Cks protein expression and function contributes to breast carcinogenesis, at least in part, by its ability to interact with Skp2. In year one of this project, we have determined the levels of Cks mRNA and protein in (i) breast cancer cell lines and (ii) normal versus tumor breast tissue. We have also developed breast cancer cell lines that overexpress cks1, cks2, or skp2, and cells that co-overexpress cks1 and skp2. In the coming year, we will focus on characterizing the breast cancer cell lines developed that stably overexpress the aforementioned cell cycle proteins, using both in vitro and in vivo techniques.

DTIC

*Biophysics; Breast; Cancer; Mammary Glands; Molecular Biology; Pathology; Proteins*

**2008000568** Brandeis Univ., Waltham, MA USA

**Effects of Inactivating Ras-Converting Enzyme or Isoprenylcysteine Carboxyl Methyltransferases in the Pathogenesis of Chronic Myelogenous Leukemia**

Ren, Ruibao; Feb 2007; 6 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0238

Report No.(s): AD-A472331; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The BCR-ABL fusion gene, the hallmark of CML, plays a causal role in the development of CML. The BCRABL tyrosine kinase inhibitors have been successfully used to treat patients with CML, but residual disease persists and drug resistance emerges. This clinical time bomb will have to be diffused in the not so distant future. Although BCR-ABL remains to be an attractive target for developing CML therapies, identifying and targeting additional essential components in the development of CML are important for overcoming resistance to BCR-ABL tyrosine kinase inhibitors and for eradicating leukemic cells. Substantial evidence indicates that Ras and Ras related proteins, which are commonly activated in human cancers, are critical mediators of BCR-ABL in leukemogenesis. Ras-converting enzyme (Rce1) and isoprenylcysteine carboxyl methyltransferase (Icmt) are two unique enzymes for Ras modifications that are critical for their functions. Targeted inactivation of Rce1 or Icmt is, therefore, an attractive strategy for the treatment of CML. The goal of this project is to determine whether targeted inactivation of Rce1 or Icmt could block BCR-ABL leukemogenesis. In the past funding period we have generated mice with conditional alleles of Rce1 or Icmt and used these mice to evaluate the importance of Rce1 in BCRABL leukemogenesis. Our preliminary results show that Rce1 plays an important role in the pathogenesis of CML.

DTIC

*Breast; Cancer; Carboxyl Group; Deactivation; Enzymes; Leukemias; Mammary Glands; Pathogenesis; Phosphorus*

**2008000569** Wisconsin Univ., Madison, WI USA

**The Role of beta-TrCP Ubiquitin Ligase Receptor in the Development of Breast Cancer**

Spiegelman, Vladimir; Jun 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0415

Report No.(s): AD-A472332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Beta-TrCP ubiquitin ligase receptor is required for activation of anti-apoptotic transcription factor NF-kappaB. Beta-TrCP activities are essential for v-Ras-mediated transformation of cells. As beta-TrCP proteins are pivotal to activation of the NF-kappaB pathway, up-regulation of NF-kappaB transactivation via an increase in beta-TrCP levels and activities may contribute to malignant transformation of cells. Under these conditions, an elevated expression of beta-TrCP is expected to promote cell transformation. Anti-apoptotic effect of NF-kappaB is suggested among the mechanisms implicated in NF-B-driven transformation. NF-kappaB has been shown capable of blocking apoptosis induced by TNFalpha, ionizing radiation, or the chemotherapeutic agents. Inhibition of NF-kappaB activities dramatically potentiates apoptosis of cancer cells induced by various pro-apoptotic stimuli. These and other data indicate that NF-kappaB inhibiting agents could become useful adjuvants in anti-tumor therapies. We hypothesize that beta-TrCP activities are essential for development of breast cancer. To this end we will employ new transgenic mice with inducible dominant negative beta-TrCP2 (dn-bTrCP2) in mammary tissues in breast carcinogenesis model and determine whether inhibition of beta-TrCP function will abrogate development of breast tumors. Since beta-TrCP mediates ubiquitination and degradation of IkappaB in response to IKK-inducing stimuli, identifying the mechanisms of beta-TrCP function in mouse mammary tumors may potentially lead to design of the agents capable of inhibiting beta-TrCP function and effective for cancer prevention and therapy. The result of this study may significantly contribute to our understanding of the development of human breast tumors.

DTIC

*Breast; Cancer; Enzymes; Health; Mammary Glands; Tumors*

**2008000570** Johns Hopkins Univ., Baltimore, MD USA

**Characterization of Odin, a Novel Inhibitory Molecule, in EGF Receptor Signaling**

Zhong, Jun; Pandey, Akhilesh; Apr 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0304

Report No.(s): AD-A472333; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Protein phosphorylation plays a key role in the regulation of the function of the proteins and the control of wide range of cellular process. Odin, one of signaling molecules identified in EGF receptor signaling pathway, functions as a negative regulator of growth factor receptor signaling pathways. To dissect the molecular mechanism of Odin in signaling pathway and its biological function, we carried out in vitro kinase assay based on peptide array and identified two new tyrosine phosphorylation sites of Odin by c-Src. We also developed two cell lines to study the protein complex of Odin by mass

spectrometry. In the future, we seek to identify the domain of Grb2 binding to Odin and the interacting protein(s) of Odin and its phosphorylation site. We also want to characterize the role of the phosphorylation in controlling the function of Odin.

DTIC

*Estrogens; Mass Spectroscopy; Peptides; Phosphorylation*

**2008000571** Johns Hopkins Univ., Baltimore, MD USA

**Characterization of Odin, a Novel Inhibitory Molecule, in EGF Receptor Signaling**

Zhong, Jun; Apr 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 281XWH-05-1-0304

Report No.(s): AD-A472334; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Protein phosphorylation plays a key role in the regulation of the function of the proteins and the control of wide range of cellular process. Odin, one of signaling molecules identified in EGF receptor signaling pathway, functions as a negative regulator of growth factor receptor signaling pathways. To dissect the molecular mechanism of Odin in signaling pathway and its biological function, we employed SILAC methodology to identify 36 interacting proteins of Odin, 34 of which are novel. In the future, we seek to verify these interactions by in vitro and in vivo experiments. Since several interacting proteins of Odin play an important role in downregulation of RTK by endocytosis, we also want to examine the function of Odin and its phosphorylation in this process.

DTIC

*Estrogens; In Vitro Methods and Tests; In Vivo Methods and Tests*

**2008000572** State Univ. of New York, NY USA

**Time-Resolved and Spectroscopic Three-Dimensional Optical Breast Tomography**

Alfano, Robert R; Apr 2007; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0461

Report No.(s): AD-A472335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research carried out during the current reporting period included: (a) Use of optical tomographic imaging using independent component analysis (OPTICA) developed during the first reporting period to image targets in ex vivo breast tissue specimens, (b) Extension of OPTICA for obtaining cross sectional image of targets in turbid media, (c) (d) Development of a forward model for scattered light intensity distribution in the backscattering geometry; and (e) Development of an approach for determination of light absorption, scattering characteristics and anisotropy factor of a highly scattering medium using backscattered circular polarized light. The OPTICA approach was able to detect and provide the location of a tumor in a model breast composed of ex vivo breast tissues, and of a fluorescent target inside another model breast with millimeter accuracy. The forward model is suitable for describing polarized light propagation and imaging in backscattering geometry. Oblique incidence backscattering method for determination of optical properties has potential application in identifying breast tissue specimen as normal or cancerous. These developments prepare us for undertaking in vivo measurements. The graduate student supported by the project defended his Ph. D. thesis, adding another scientist to the ongoing fight against breast

DTIC

*Breast; Cancer; Mammary Glands; Optical Properties; Spectroscopy; Tomography*

**2008000576** Alabama Univ., Birmingham, AL USA

**Interdisciplinary Breast Cancer Training Program**

Lamartiniere, Coral A; Sep 2006; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0119

Report No.(s): AD-A472340; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of the University of Alabama at Birmingham Interdisciplinary Breast Cancer Training Program (IBCTP) is to educate and train predoctoral students in a multidisciplinary environment with a focus on breast cancer research. The aims are to 1) recruit predoctoral trainees to the IBCTP; 2) assure that predoctoral trainees obtain a broad-based breast cancer education and carry out interdisciplinary breast cancer research; 3) administer this program with sufficient oversight to ensure high-quality education and training, efficient completion of degree requirements, and productive research careers. Our training program is designed to prepare and motivate trainees to pursue careers in the fields of breast cancer causation, prevention, diagnosis, therapy and education.

DTIC

*Breast; Cancer; Education; Mammary Glands*

**2008000577** California Univ., Irvine, CA USA

**Combined MR and Optical Imaging System for Noninvasive Tumor Characterization and Quantification of Oxygenation Gain Factor in a Breast Cancer Animal Model**

Shafiiha, Roshanak; Jun 2007; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0443

Report No.(s): AD-A472342; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study proposes to modify and improve an existing MR-compatible optical tomography system that is used for non-invasive tumor characterization and provides higher sensitivity and specificity for cancer imaging. The proposed research will conduct animal studies to evaluate the system's performance in distinguishing malignant from benign tumors in vivo. Additional experiments will be designed to assess the method's sensitivity to quantifying oxygenation gain factor in breast tumors. This investigation will have important implications for studies identifying tumor's hypoxic regions. Tumor hypoxia is believed to be strongly associated with tumor progression, prognosis, and resistance to therapy. In the first year of this multidisciplinary postdoctoral training grant, the principal investigator acquires training in breast cancer and dynamic contrast enhanced MRI. The major focus is on optical imaging system development/improvement and performance evaluation through phantom studies. We managed to increase the data acquisition speed by a factor of 10, which enabled us to perform dynamic contrast enhanced diffuse optical tomography on phantoms for the first time.

DTIC

*Animals; Breast; Cancer; Imaging Techniques; Magnetic Resonance; Mammary Glands; Oxygenation; Tomography; Tumors*

**2008000584** Wisconsin Univ., Madison, WI USA

**Identification of Genes Regulating the Development of Breast Cancer**

Wang, Hua; Moser, Amy; Apr 2007; 7 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0413

Report No.(s): AD-A472358; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Breast cancer develops through multiple steps which are rigorously controlled by genetic factors. It is essential to identify and characterize genes controlling the development of breast cancer to better understand factors affecting tumor susceptibility and contribute to better diagnosis and treatment. We are using a well characterized mouse model, *ApcMin/+* mice, to identify genes important for breast cancer progression and development. As the first step to identify modifier gene, we backcrossed B6-*ApcMin/+* to the resistant strain FVB. Four novel modifier loci have been mapped to influence different aspects of mammary tumor development in *ApcMin/+* mice. Analysis of tumor development in a backcross of (FVBB6 *ApcMin/+*) x B6 *ApcMin/+* mice has identified a modifier on chromosome 9 that significantly affects tumor multiplicity, and a modifier on chromosome 4 that significantly affects tumor latency and affects tumor number with suggestive significance. This modifier was also identified in a backcross involving 129X1/SvJ and B6 *ApcMin/+* mice. A modifier on chromosome 18 specifically affects tumor latency but not tumor number. Kaplan-Meier analysis suggests there is at least an additive interaction affecting tumor latency between the loci on chromosomes 4 and 18. I also identified a modifier locus on chromosome 6 that interacts with the loci on chromosome 4 and chromosome 9 to affect tumor number. To further identify genes underlying these modifier loci, I generated and congenic mice on chromosome 4 and 9. Preliminary analysis provide evidence for the modifier on chromosome 4.

DTIC

*Breast; Cancer; Genes; Genetics; Mammary Glands*

**2008000585** Wisconsin Univ., Madison, WI USA

**Investigation of Rho Signaling Pathways in 3D Collagen Matrices via Multidimensional Microscopy and Visualization Techniques**

Trier, Steven; Mar 2007; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0393

Report No.(s): AD-A472359; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Spatial-temporal dynamics of proteins involved in cell-cell communication, cell-extracellular matrix interactions, and ultimately tissue organization are difficult to study using conventional biochemical approaches. Recent progress in the development of 3D culture models has provided a more physiologically relevant growth environment, in which breast cancer cells imbedded within floating collagen matrices undergo morphogenesis, in part, through contraction of the surrounding matrix. The importance of rho kinase (ROCK) generated contractility in this process has previously been demonstrated through antibody staining of cells imbedded in collagen matrices of differing rigidities and treatment with pharmacological ROCK inhibitors. We are stably transfecting T47D human breast cancer cells, cultured within floating collagen matrices, with

fluorescent fusion proteins, and observing them through the course of morphogenesis (5-11 days). Spectral Lifetime Imaging Microscopy (SLIM) is used to separate second harmonic generated (SHG) signals from intrinsic and extrinsic fluorescence signals. Together these multidimensional signals map targeted regions of intercellular protein environment and their interaction with the extracellular matrix and can be applied to further studies of cell adhesion and motility.

DTIC

*Breast; Cancer; Collagens; Inspection; Mammary Glands; Microscopy; Visual Observation*

**2008000586** Oregon Health Sciences Univ., Portland, OR USA

**Exploration of Prostate Cancer Treatment Induced Neurotoxicity with Neuroimaging**

Janowsky, Jenri; May 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0033

Report No.(s): AD-A472360; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The current study sought to establish and test noninvasive neuroimaging methods to investigate the brain basis of cognitive decline in men on ADT. Healthy men showed better memory than men on ADT in a word learning task. Men with prostate cancer but who are not on ADT did not differ in memory from healthy older men. We found no group differences in several other cognitive tasks, including paragraph recall and the Trails task (a test of working memory). We compared brain activation during the word learning task in healthy men versus men on ADT. Although both groups activated the medial frontal gyrus when encoding words, activation was greater in men on ADT and men on ADT activate more regions, particularly in the prefrontal cortex, in order to encode information in memory. In conclusion, this pilot project suggests that neuroimaging methods can be useful in illuminating changes in brain activity that accompany behavioral loss of memory induced by ADT.

DTIC

*Cancer; Prostate Gland*

**2008000587** Mount Sinai School of Medicine, New York, NY USA

**Role of Cdc25C Phosphatases in Human Breast Cancer**

Manfredi, James J; Mar 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0305

Report No.(s): AD-A472361; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A summary is presented of research performed during the first year of a project to determine the role of Cdc25 phosphatases in human breast cancer. Three specific aims are being pursued. The first is to determine the role of Cdc25B in breast cancer proliferation. The second aim is examining whether alternative splicing of Cdc25C contributes to human breast cancer. The final aim is to explore a potential novel breast cancer therapy involving altered expression of Cdc25C. The long term goals of this research is to validate a clear role for Cdc25B in breast tumor cell proliferation and to rigorously determine whether Cdc25C may contribute to human breast tumorigenesis in other ways besides its overexpression.

DTIC

*Breast; Cancer; Mammary Glands*

**2008000588** Washington Univ., Saint Louis, MO USA

**Chromatin Structure and Breast Cancer Radiosensitivity**

Pandita, Tej K; Oct 1, 2006; 10 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0356

Report No.(s): AD-A472362; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The hMOF protein is a chromatin-modifying factor. Chromatin structure plays a critical role in gene expression. Since hMOF has a chromodomain region as well as acetyl transferase activity, its inactivation can influence modification of chromatin during DNA metabolism. The proposed experiments of this grant proposal will determine functions of hMOF gene. This will be achieved by generating isogenic cells with and without hMOF function. Both in vivo and in vitro experiments will be performed to determine the function of hMOF in context with radioresponsiveness and oncogenic transformation. If hMOF proves to be involved in the radioresponsiveness and neoplastic transformation, then the clinical implications of this proposal are highly significant. It may, in the future, be prudent to screen each breast cancer patient prior to any final therapeutic decision. This will be accomplished through the use of quantitative RT-PCR and the test results can be obtained within a day. There are several benefits of identifying an individual's normal tissue with loss of hMOF gene expression. First, it will allow us to prospectively identify the sensitive subset of patients. Second, the radiosensitive patients will be taken for an alternative therapy if exist and would be spared a great deal of suffering. Third, it will be possible that once we identify

a subset of patients that show a genetic basis of radiation sensitivity, the radiation dose to the remaining breast patients could be increased to be more effective for local tumor control. Fourth, it will provide health professionals a molecular diagnostic approach to predict the suitability of an individual for radiotherapy.

DTIC

*Breast; Cancer; Chromatin; Genes; Mammary Glands; Proteins; Radiation Tolerance; Sensitivity*

**2008000590** Washington Univ., Saint Louis, MO USA

**Aberrant NPM Expression during Nf1 Loss and Its Role in Promoting Proliferation**

Weber, Jason D; Dec 2006; 46 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0129

Report No.(s): AD-A472364; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nf1 encodes a novel tumor suppressor protein named neurofibromin that acts to inhibit the Ras oncogene. A recent study demonstrated that the nucleolar proto-oncogene nucleophosmin (NPM) was highly expressed in Nf1 deficient astrocytes along with numerous other ribosomal biosynthesis proteins. NPM senses abnormal growth signals within the astrocyte and responds by increasing protein synthesis rates. We are hypothesizing that these increased rates are partly responsible for the aberrant growth of Nf1-deficient astrocytes. Thus, the goal of this work will be to determine the contribution of elevated NPM levels to astrocyte proliferation. We believe that the insights gained from this study will greatly improve our understanding of the mechanism(s) by which neurofibromin loss promotes cell growth and proliferation. This work could be translated into any number of cell systems implicated in NF1 due to its mechanistic and evolutionary conservation. In addition, our results will open up a new generation of targets aimed at disrupting aberrant protein translation networks that appear to go awry during Neurofibromatosis.

DTIC

*Aberration; Abnormalities*

**2008000591** Maryland Univ., Baltimore, MD USA

**Undergraduate Training Program in Breast Cancer Research**

Ostrand-Rosenberg, Suzanne; Dec 2005; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0313

Report No.(s): AD-A472365; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this Training Program is to direct talented undergraduates into careers in breast cancer research. The program, called Breast Cancer Undergraduate Research Experience (BCURE), is a joint program between The University of Maryland Baltimore County (UMBC) and the University of Maryland, Baltimore Medical School (UM,B). The centerpiece of BCURE is a full-time, 10-week summer research experience in the laboratory of an established investigator (mentor) working in breast cancer research. Ten UMBC and UM,B faculty, whose research programs focus on breast cancer, serve as mentors. The Program Director is a well-respected breast cancer investigator who has personally trained >50 undergraduates. Trainees also participate in a Breast Cancer Course and an optional Biomedical Research Ethics course. Trainees present their projects at laboratory meetings, program conferences, UMBC Undergraduate Research Day, as well as at national and international meetings, if appropriate, and in research activities such as journal clubs and seminars. They meet regularly with the Program Director and formally present their research at Breast Cancer Research Day. BCURE trainees include UMBC and on-UMBC undergraduates and represent the diverse population in the Baltimore area. The program includes eight trainees per summer.

DTIC

*Breast; Cancer; Education; Mammary Glands; Medical Science; Occupation; Students*

**2008000593** Duke Univ., Durham, NC USA

**Reaper-Induced Cytochrome C Release**

Gan, Eugene; Aug 2005; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0232

Report No.(s): AD-A472371; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Apoptosis is a program of cellular suicide that removes individual cells from the midst of a living tissue without destroying overall tissue architecture. In response to chemotherapeutic agents, cells die by apoptosis. Moreover, inhibition of apoptosis is a hallmark of cancers. In this proposal, we proposed to understand the molecular basis for apoptosis induced by the proapoptotic protein, Reaper. Having purified and characterized a protein, Scythe, acting downstream of Reaper to trigger

mitochondrial cytochrome c release and cell death, we wished to determine how these proteins might cooperate to execute the apoptotic program..

DTIC

*Apoptosis; Cancer; Chemotherapy; Cytochromes; Drugs; Mitochondria; Proteins*

**2008000596** University of South Florida, Tampa, FL USA

**The Role of the Prohibitin Gene in Apoptosis of Breast Cancer Cells**

Kinkade, Rebecca; Chellappan, Srikumar; Apr 2005; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0215

Report No.(s): AD-A472375; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prohibitin, a potential tumor suppressor protein, was originally identified by its ability to induce G1/S arrest in human fibroblasts. Mutations in the prohibitin gene were subsequently found in sporadic breast tumors. Our experiments in B cells and breast cancer cells suggest that prohibitin protects against apoptosis induced by camptothecin, a topoisomerase I inhibitor. A human B cell line (Ramos) stably overexpressing prohibitin and treated with camptothecin exhibits 50% less apoptosis compared to the parental cell line. BT 549 breast cancer cells, which express high levels of endogenous prohibitin, exhibit 20% less death from camptothecin than ZR 751 cells, which have low levels. E2F transcriptional activity increases in response to camptothecin, but this increase is attenuated in cells overexpressing prohibitin. Moreover, we find that prohibitin and p53 associate in vitro and co-localize in the breast cancer cell lines MCF7 and T47D. Functionally, prohibitin may activate p53 mediated transcription and augment p53 binding to a target promoter. Further, prohibitin was specifically exported from the nucleus of breast cancer cells, but not normal cells.. The role of this in cellular apoptosis is being evaluated. Our studies are elucidating the mechanisms whereby prohibitin affects the chemotherapeutic response and may help in directing therapeutic strategies for breast cancer treatment.

DTIC

*Apoptosis; Breast; Cancer; Chemotherapy; Fibroblasts; Genes; Mammary Glands*

**2008000602** Meharry Medical Coll., Nashville, TN USA

**Gene-Gene and Gene-Environment Interactions in the Etiology of Breast Cancer**

Marshall, Dana R; Adegoke, Olufemi J; Zheng, Wei; Jun 2007; 65 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0482

Report No.(s): AD-A472397; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this proposal is to evaluate gene-gene and gene-environment interactions in the etiology of breast cancer in two ongoing case-control studies, the Shanghai Breast Cancer Study (SBCS) and the Nashville breast health Study (NBHS) and in a proposed case-control study, the Breast Cancer in West Africa Study (BCAWS). An allelic variant of UGT1A1 (allele\*28) was identified as a risk factor for postmenopausal breast cancer in Chinese women. A proposal was submitted and funded for the BCAWS study through U54-CA9140801 Adunyah (PI). Samples and surveys acquired from the BCAWS study are currently being analyzed.

DTIC

*Breast; Cancer; Etiology; Genes; Genetics; Mammary Glands; Risk*

**2008000603** Duke Univ., Durham, NC USA

**A Computer-Aided Diagnosis System for Breast Cancer Combining Mammography and Proteomics**

Jesneck, Jonathan; May 2007; 85 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0292

Report No.(s): AD-A472398; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study investigated a computer-aided diagnosis system for breast cancer by combining the following three data sources: mammogram films, radiologist-interpreted BI-RADS descriptors, and proteomic profiles of blood sera. We implemented under 100-fold cross-validation various classification algorithms, including Bayesian probit regression, iterated Bayesian model averaging, linear discriminant analysis, artificial neural networks, as well as a novel method of decision fusion. The top-performing classifier, decision fusion achieved AUC = 0.85 0.01 on the calcification data set and 0.94 0.01 on the mass data set. Decision fusion had a slight performance gain over the ANN and LDA ( $p = 0.02$ ), but was comparable to Bayesian probit regression. Decision fusion significantly outperformed the other classifiers ( $p < 0.001$ ). The blood serum proteins detected lesions moderately well (AUC = 0.82 for normal vs. malignant and normal vs. benign) but failed to

distinguish benign from malignant lesions (AUC = 0.55), suggesting they indicate a secondary effect, such as inflammatory response, rather than a role specific for cancer.

DTIC

*Blood; Breast; Cancer; Computer Techniques; Diagnosis; Mammary Glands; Proteome; Serums*

**2008000608** California Univ., Berkeley, CA USA

**Establishment of an 'In Vitro Cell-Based System' to Assay Radiation Sensitivity in Breast Cancer**

Langland, Gregory T; May 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0527

Report No.(s): AD-A472420; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this proposal is to develop an 'in vitro cell-based system' to study radio-resistance in sporadic breast cancer. By performing colony formation assays in response to X-ray treatment we have shown that there is a wide range of sensitivities to this form of treatment. Interestingly, we have also observed that tp53 status does not accurately predict response to radiation treatment. We have sensitized one of our most radio-resistant breast cancer cell lines to X-ray treatment by using RNAi-based technology to inhibit Artemis function. In the future, we feel these observations will have a significant clinical impact on the way radiation oncologists treat breast cancer patients.

DTIC

*Assaying; Breast; Cancer; Mammary Glands; Radiation Effects; Radiation Therapy; Sensitivity*

**2008000619** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Neurobehavioral Toxicity Assessment**

Friedl, Karl; Grate, Stephen; Proctor, Susan; Sep 2007; 20 pp.; In English

Report No.(s): AD-A472461; ARIEM-T07-11; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Military Operations; Toxicity*

**2008000620** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Evaluation of the Limits to Accurate Sweat Loss Prediction During Prolong Exercise**

Chevront, S N; Montain, S J; Goodman, D A; Blanchard, L; Sawka, M N; May 2007; 11 pp.; In English

Report No.(s): AD-A472462; USARIEM-M06-37; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Sweat prediction equations are often used outside their boundaries to estimate fluid requirements and generate guidance. The limitations associated with these generalized predictions have not been characterized. The purpose of this study were to: 1) evaluate the accuracy of a widely used sweat prediction equation (SHAP) when widening it's boundaries to include cooler environments (2h) and very prolonged exercise (8h), 2) determine the independent impact of holding skin temperature constant (SHAP36), and 3) describe how adjustments for non-sweat losses(NSL) and clothing saturation dynamics effect prediction accuracy. Water balance was measured in 39 volunteers during 15 trails that included intermittent treadmill walking for 2h (300 to 600 W, 15 to 30oC; n=21) or 8h (300 to 420 W, 20 to 40oC; n=18). Equation accuracy was assessed by comparing actual and predicted sweating rates(211 observations) using least-squares regression. Mean and 95% confidence intervals for group differences were compared against a zone of indifference ( $\pm 0.125$  L/h). Sweating rate variance accounted for by SHAP and SHAP36 was always high ( $r^2 > 0.70$ ), while the standard error of the estimate was small and uniform around the line of best fit. SHAP predictions were  $> 0.125$  L/h during 2h and 8h of exercise. SHAP36 predictions were  $< 0.125$  L/h for 2h conditions but were higher at 8h, respectively. These results provide a basis for future development of accurate algorithms with broader utility.

DTIC

*Losses; Physical Exercise; Protective Clothing; Sweat; Treadmills; Water*

**2008000621** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Military Applications of Hypoxic Training for High-Altitude Operations**

Muza, Stephen R; May 2007; 8 pp.; In English

Report No.(s): AD-A472463; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rapid deployment of unacclimatized soldiers to high mountainous environments causes debilitating effects on operational capabilities (physical work performance), and force health (altitude sickness). Most of these altitude-induced debilitations can



be prevented or ameliorated by a wide range of physiological responses collectively referred to as altitude acclimatization.  
DTIC

*Education; High Altitude; Hypoxia; Military Technology*

**20080000622** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Chapter 5 - Common Military Task: Materials Handling**

Sharp, Marilyn; Rosenberger, Mary; Knapik, Joseph; Sep 2006; 50 pp.; In English

Report No.(s): AD-A472464; USARIEM/MN-MISC-06-31; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Lift; Materials Handling*

**20080000623** Albany Medical Coll., NY USA

**Evaluation of Altered Stromal/Epithelial Tissue Arrangement of the c-Kit Messaging System in the Control of Breast Cancer**

Bennett, James A; Jul 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0592

Report No.(s): AD-A472465; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this research is to evaluate stromal influence on breast cancer growth particularly the role of c-Kit expression in the stroma on the growth and migration of breast cancer cells. The model is based on obtaining breast cancer cells and stromal cells from the same patient, growing these cells in an organotypic environment in culture and in immune deficient mice, and studying the influence of c-Kit modulation on tumor behavior. The fibroblasts surrounding a breast cancer influence the morphology, migration, and proliferation of the breast cancer. The breast cancer becomes more rounded, less connected to its neighboring cells, more proliferative and more invasive in the presence of fibroblasts. The fibroblasts and breast cancer under study both express c-Kit, the fibroblasts more so than the breast cancer. Strategies which inhibit c-Kit as well as strategies which overexpress c-Kit in the fibroblasts are being studied to determine their effect on the growth and migration of the breast cancer cells.

DTIC

*Breast; Cancer; Fibroblasts; Kits; Mammary Glands*

**20080000625** Army Research Inst. of Environmental Medicine, Natick, MA USA

**PTSD Symptoms, Life Events, and Unit Cohesion in U.S. Soldiers: Baseline Findings From the Neurocognition Deployment Health Study**

Brailey, K; Vasterling, J J; Proctor, S P; Constans, J I; Friedman, M J; Aug 2007; 10 pp.; In English

Contract(s)/Grant(s): USARIEM/TMMD-M06-26

Report No.(s): AD-A472468; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Relationships among a modifiable situational factor (unit cohesion), prior stressful life events, and posttraumatic stress disorder (PTSD) symptoms were assessed in 1,579 U.S. Army soldiers with no history of contemporary war zone deployment. It was predicted that unit cohesion would attenuate the dose-response relationship between past stressor exposures and PTSD symptoms at relatively moderate levels of exposure. Consistent with this hypothesis, regression analysis revealed that life experiences and unit cohesion strongly and independently predicted PTSD symptoms, and that unit cohesion attenuated the impact of life expectancy on PTSD. Some military personnel reported significant predeployment, stress-related symptoms. These symptoms may serve as vulnerabilities that could potentially be activated by subsequent war-zone deployment. Higher predeployment unit cohesion levels appear to ameliorate such symptoms, potentially lessening future vulnerability.

DTIC

*Cohesion; Deployment; Disorders; Health; Injuries; Mental Health; Signs and Symptoms*

**20080000626** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Thermal Responses for Men With Different Fat Compositions During Immersion in Cold Water at Two Depths: Prediction versus Observation**

Xu, Xiaojiang; Castellani, John W; Santee, William; Kolka, Margaret; Feb 16, 2007; 11 pp.; In English

Report No.(s): AD-A472469; M06-29; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A cold thermoregulatory model (CTM) was applied to data from partially immersed subjects divided into normal (NF)

or low fat (LF) groups in order to validate CTM during immersion at two depths and to examine mechanisms underlying the individual differences. CTM defines thermal characteristics, e.g. surface area and maximal shivering intensity, using height, weight, fat%, age and VO<sub>2</sub>max. Ten clothed subjects, 5 NF (15-19%) and 5 LF (8.1-14.7%), were immersed in both 10 and 15 C water at chest (CH) and waist (WA) level. Environmental and clothing inputs for CTM were weighted to adjust for the ratio of skin surface area covered by either air or water at various immersion depths. Predicted core temperature (T<sub>c</sub>) responses for each individual trial were compared with measured data. There were no significant differences ( $p > 0.05$ ) between measured T<sub>c</sub> and predicted T<sub>c</sub> for NF at all four conditions. In contrast, for the LF group, the predicted T<sub>c</sub> responses were all higher than measured ( $p < 0.05$ ). However, predicted T<sub>c</sub> agreed closer with measured T<sub>c</sub> for LF when leg muscle blood flow was increased in the simulation, and predicted T<sub>c</sub> is more sensitive to changes in blood flow than changes in shivering. This suggests that blood flow may contribute to the rapid decline in T<sub>c</sub> observed in LF and its variance may cause in part the individual differences in T<sub>c</sub> responses. CTM predicts T<sub>c</sub> responses to immersion at various depths with acceptable accuracy for NF individuals in this study and can be adapted to non-uniform environments.

DTIC

*Cold Water; Fats; Human Beings; Males; Temperature Control; Water Immersion*

**2008000628** Thomas Jefferson Univ., Philadelphia, PA USA

### **Prolactin Receptor Coupling to Jak-Stat Pathways in Breast Cancer**

Neilson, Lynn; Jul 2007; 30 pp.; In English

Report No.(s): AD-A472476; W81XWH-06-1-0553; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prolactin receptors (PRLR) have been considered selective activators of tyrosine kinase Jak2 but not Jak1, Jak3 or Tyk2. We now report marked PRL-induced tyrosine phosphorylation of Jak1, in addition to Jak2, in a series of human breast cancer cell lines, including T47D, MCF7, and SKBR3. In contrast, PRL did not activate Jak1 in immortalized, noncancerous breast epithelial lines HC11, MCF10A, ME16C, and HBL-100, or in CWR22Rv1 prostate cancer cells or MDA-MB-231 breast cancer cells. However, introduction of exogenous PRLR into MCF10A, ME16C, or MDA-MB-231 cells reconstituted both PRL-Jak1 and PRL-Jak2 signals. PRL activated Jak1 through a Jak2-dependent mechanism in T47D cells, based on disruption of PRL activation of Jak1 following Jak2 suppression by 1) lentiviral delivery of Jak2 shRNA, 2) adenoviral delivery of dominant-negative Jak2, and 3) AG490 pharmacological inhibition. Finally, suppression of Jak1 by lentiviral delivery of Jak1 shRNA blocked PRL activation of ERK and Stat3, and suppressed PRL activation of Jak2, Stat5a, Stat5b, and Akt, as well as tyrosine phosphorylation of PRLR. The data suggest that PRL activation of Jak1 represents a novel, Jak2-dependent mechanism that may serve as a regulatory switch leading to PRL activation of ERK and Stat3 pathways, while also serving to enhance PRL-induced Stat5a/b and Akt signaling.

DTIC

*Activation; Breast; Cancer; Mammary Glands; Pituitary Hormones*

**2008000629** Air Force Research Lab., Tyndall AFB, FL USA

### **Silica-Immobilized Enzyme Reactors**

Luckarift, Heather R; Aug 2007; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915

Report No.(s): AD-A472477; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent studies have demonstrated the applicability and versatility of immobilized enzyme reactors (IMERS) for chemical and biochemical synthesis and analysis. The majority of IMER systems rely on enzymes immobilized to packed matrices within flow-through devices. This review focuses primarily on the use of silica as a support for enzyme immobilization and specific applications of the resulting silica-based IMERS. A number of recently published examples (from 2000 onwards) are discussed as model systems. The effect of various silica matrices and immobilization techniques upon the enzymatic properties and stability of the biocatalysts is considered. In particular, reports in which the carrier matrix is biologically-derived silica is emphasized and demonstrated as a versatile technique in terms of advantageous recovery, reuse and reproducibility.

DTIC

*Enzymes; Silicon Dioxide*

**2008000636** Army Research Inst. of Environmental Medicine, Natick, MA USA

### **Chapter 9 - Neurotoxicological Interactions with Physical and Psychological Stressors**

Friedl, Karl; Grate, Stephen; Proctor, Susan; Sep 2007; 27 pp.; In English

Report No.(s): AD-A472490; USAREM-T07-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Deployment; Gulfs; Health; Medical Science; Neurology; Sicknesses; Warfare*

**20080000870** National Inst. of Aerospace, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA  
**Direct Assembly of Modified Proteins on Carbon Nanotubes in an Aqueous Solution**

Kim, Jae-Woo; Lillehei, Peter T.; Park, Cheol; Harrison, Joycelyn S.; November 26, 2007; 1 pp.; In English; 2007 Materials Research Society (MRS) Fall Meeting, 26-30 Nov. 2007, Boston, MA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Carbon nanotubes (CNTs) have superior mechanical and electrical properties that have opened up many potential applications. However, poor dispersibility and solubility, due to the substantial van der Waals attraction between tubes, have prevented the use of CNTs in practical applications, especially biotechnology applications. Effective dispersion of CNTs into small bundles or individual tubes in solvents is crucial to ensure homogeneous properties and enable practical applications. In addition to dispersion of CNTs into a solvent, the selection of appropriate solvent, which is compatible with a desired matrix, is an important factor to improve the mechanical, thermal, optical, and electrical properties of CNT-based fibers and composites. In particular, dispersion of CNTs into an aqueous system has been a challenge due to the hydrophobic nature of CNTs. Here we show an effective method for dispersion of both single wall CNTs (SWCNTs) and few wall CNTs (FWCNTs) in an aqueous buffer solution. We also show an assembly of cationized Pt-cored ferritins on the well dispersed CNTs in an aqueous buffer solution.

Author

*Aqueous Solutions; Carbon Nanotubes; Proteins; Electrodes; Nanoparticles*

**20080000956** Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA  
**Live Vaccine Strain Francisella tularensis is Detectable at the Inoculation Site but Not in Blood after Vaccination Against Tularemia**

Hepburn, Matthew J; Purcell, Bret K; Lawler, James V; Coyne, Susan R; Pettitt, Patricia L; Sellers, Karen D; Norwood, David A; Ulrich, Melanie P; Aug 10, 2006; 8 pp.; In English

Report No.(s): AD-A472536; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472536>

Live vaccine strain (LVS) *Francisella tularensis* is a live, attenuated investigational tularemia vaccine that has been used by the US Army for decades to protect laboratory workers. Postvaccination bacterial kinetic characteristics of LVS at the inoculation site and in the blood are unknown and, therefore, were assessed in a prospective study. LVS vaccination of laboratory workers provided the opportunity to compare culture with polymerase chain reaction (PCR) for the detection of *F. tularensis* in human clinical samples. Methods. Blood and skin swab samples were prospectively collected from volunteers who received the LVS tularemia vaccine at baseline (negative controls) and at 5 specified time points (days 1, 2, 7 or 8, 14 or 15, and 35 after vaccination). Bacterial culture and PCR of whole blood samples (17 volunteers) and inoculation site swabs (41 volunteers) were performed. Results. The culture and PCR results of all blood samples were negative. Results of real-time PCR from the inoculation site samples were positive for 41 (100%) of 41 volunteers on day 1, for 40 (97.6%) of 41 volunteers on day 2, for 24 (58.5%) of 41 on day 7 or 8, for 6 (16.7%) of 36 on day 14 or 15, and for 0 (0%) of 9 on day 35. Positive results of bacterial cultures of the inoculation site samples occurred significantly less frequently, compared with PCR testing, with 4 (9.8%) of 41 volunteers having positive results on day 1 ( $P < .001$ ) and 4 (9.8%) of 41 on day 2 ( $P < .001$ ); all results from subsequent days were negative. Conclusions. *F. tularensis* LVS genomic DNA was detected in the majority of samples from the inoculation site up to 1 week after LVS vaccination, with real-time PCR being more sensitive than culture. Our data suggest that bacteremia does not occur after LVS vaccination in normal, healthy human volunteers.

DTIC

*Blood; Inoculation; Vaccines*

**20080000961** General Accounting Office, Washington, DC USA  
**Defense Health Care. Comprehensive Oversight Framework Needed to Help Ensure Effective Implementation of a Deployment Health Quality Assurance Program**

Farrell, Brenda S; Jun 2007; 43 pp.; In English

Report No.(s): AD-A472549; GAO-07-831; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472549>

Overseas deployments expose service members to a number of potential risks to their health and well-being. However, since the 1990s, GAO has highlighted shortcomings with respect to the Department of Defense's (DOD) ability to assess the medical condition of servicemembers both before and after their deployments. Following GAO's May 1997 report, Congress enacted legislation (10 U.S.C. 1074f) that required the Secretary of Defense to establish a medical tracking system for assessing the medical condition of servicemembers before and after deployments. GAO was asked to determine (1) whether

DOD has established a medical tracking system to comply with requirements of 10 U.S.C. 1074f pertaining to pre- and postdeployment medical examinations, and (2) the extent to which DOD has effectively implemented a deployment health quality assurance program as part of its medical tracking system. In conducting this review, GAO analyzed pertinent documents and interviewed DOD officials. GAO is recommending that DOD develop a comprehensive oversight framework with reporting requirements and results-oriented performance measures to improve the implementation of its deployment health quality assurance program. In reviewing draft of this report, DOD concurred with GAO's recommendations.

DTIC

*Deployment; Health; Military Personnel; Quality Control*

**20080000981** Akron Univ., Akron, OH USA

**Processing, Properties and Morphology of Optical Limiting Silk Membranes**

Reneker, Darrell; Jul 11, 2007; 16 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0188

Report No.(s): AD-A472599; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472599>

This grant supported the exploratory research in optical limiting silk membranes and coatings to protect DOD sensors from strong IR radiation.

DTIC

*Fluorescence; Infrared Detectors; Membranes; Morphology; Proteins; Silk*

**20080000986** Massachusetts Inst. of Tech., Cambridge, MA USA

**Interacting Populations: Hosts and Pathogens, Prey and Predators**

Klepac, Petra; Jun 2007; 179 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DEB-0235692; R-82908901

Report No.(s): AD-A472607; MIT/WHOI-2007-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472607>

The interactions between populations can be positive, neutral or negative. Predation and parasitism are both relationships where one species benefits from the interaction at the expense of the other. Predators kill their prey instantly and use it only for food, whereas parasites use their hosts both as their habitat and their food. I am particularly interested in microbial parasites (including bacteria, fungi, viri, and some protozoans) since they cause many infectious diseases. This thesis considers two different points in the population-interaction spectrum and focuses on modeling host-pathogen and predator-prey interactions. The first part focuses on epidemiology, i. e., the dynamics of infectious diseases, and the estimation of parameters using the epidemiological data from two different diseases, phocine distemper virus that affects harbor seals in Europe, and the outbreak of HIV/AIDS in Cuba. The second part analyzes the stability of the predator-prey populations that are spatially organized into discrete units or patches. Patches are connected by dispersing individuals that may, or may not differ in the duration of their trip. This travel time is incorporated via a dispersal delay in the interpatch migration term, and has a stabilizing effect on predator-prey dynamics.

DTIC

*Bacteria; Microorganisms; Pathogens; Predators*

**20080000992** Kansas Univ., Lawrence, KS USA

**The Design, Synthesis, and Biological Evaluation of New Paclitaxel Analogs With the Ability to Evade Efflux by P-Glycoprotein**

Turunen, Brandon J; May 2005; 54 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0435

Report No.(s): AD-A472618; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472618>

Regioisomeric functional group and one-carbon homologs of the semi-synthetic paclitaxel compound TX-67 (C10 hemi-succinate) have been prepared to investigate its lack of interaction with P-glycoprotein (Pgp). In accord with Seelig's model and our previous reports all carboxylic acid analogs had no apparent interactions with Pgp. Furthermore it is demonstrated that hydrogen-bonding properties were significant with respect to Pgp interactions. This anionic introduction strategy may allow

for delivery of paclitaxel into the CNS as well as establishing an alternative strategy for delivery of other non-CNS permeable drugs.

DTIC

*Drugs; Efflux; Proteins*

**20080001002** University of the Sciences in Philadelphia, Philadelphia, PA USA

**Enhancing Tumor Drug Delivery by Laser-Activated Vascular Barrier Disruption**

Chen, Bin; He, Chong; Dec 2006; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0148

Report No.(s): AD-A472631; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472631>

An obstacle for successful drug therapy for cancer is the existence of drug delivery barriers, which causes insufficient drug delivery to the tumor tissue. Because of inadequate drug delivery to the tumor tissue, the drug dose has to be increased, which leads to normal tissue toxicity. This delivery problem not only limits the clinical application of existing chemotherapeutics, but also decreases the effectiveness of many new drugs under development for prostate cancer. We found that vascular targeting photodynamic therapy (PDT), a modality involving the combination of a photosensitizer and laser light, is able to disrupt tumor vascular barrier, a significant hindrance to drug delivery. Therefore, tumor accumulation of circulating molecules is significantly enhanced, as demonstrated by intravital fluorescence microscopy and whole-body fluorescence imaging techniques. Immunofluorescence staining of endothelial cytoskeleton structure further indicates microtubule depolymerization, stress actin fiber formation and intercellular gap formation. Based on these results, we propose to use this laser-based therapy to enhance anticancer drug effectiveness. PDT is currently in worldwide multicenter clinical trials for the localized prostate cancer therapy. The available results indicate that PDT employing advanced laser fiber technology and sophisticated light dosimetry is able to treat localized prostate cancer in an effective and safe way. The combination of photosensitization with current chemotherapy or other new drug therapies will greatly improve clinical treatment for localized prostate cancer patients that accounts for more than 90% of total prostate cancer population.

DTIC

*Cancer; Cardiovascular System; Drugs; Lasers; Prostate Gland; Tumors*

**20080001005** Massachusetts Inst. of Tech., Cambridge, MA USA

**Comparative Analyses of Aryl Hydrocarbon Receptor Structure, Function, and Evolution in Marine Mammals**

Lapsieritis, Joy M; Feb 2007; 163 pp.; In English

Contract(s)/Grant(s): NA16RG2273; NA03NMF4720475

Report No.(s): AD-A472638; MIT/WHOI2007-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472638>

Marine mammals possess high body burdens of persistent organic pollutants, including PCBs and dioxin-like compounds (DLC). Chronic environmental or dietary exposure to these chemicals can disrupt the function of reproductive and immune systems in laboratory animals. The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor, mediating the expression of a suite of genes in response to exposure to DLC and structurally related chemicals. Species-specific differences in AHR structure can affect an organism's susceptibility to the effects of DLC. The structures and functions of several cetacean AHRs were investigated using *In vitro* molecular cloning and biochemical techniques. Using remote biopsy and molecular cloning methods, RNA was extracted from small integument samples from living North Atlantic right whales to identify the AHR cDNA sequence and other genes. Molecular and biochemical characteristics for North Atlantic right whale and humpback whale AHR cDNAs were determined using *in vitro* and cell culture methods. The properties of these AHRs were compared with those from other model and marine mammalian species using biochemical, phylogenetic, and homology modeling analyses. Additional studies are necessary to link exposure to environmental contaminants with potential reproductive effects in marine mammals, especially via interactions with steroid hormone receptor pathways.

DTIC

*Hormones; Hydrocarbons; Immunity; In Vitro Methods and Tests; Marine Biology; Marine Mammals*

**20080001014** Library of Congress, Washington, DC USA

**Pandemic Influenza: An Analysis of State Preparedness and Response Plans**

Lister, Sarah A; Stockdale, Holly; Sep 24, 2007; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472657; CRS-RL34190; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472657>

States are the seat of most authority for public health emergency response. Much of the actual work of response falls to

local officials. However, the federal government can impose requirements upon states as a condition of federal funding. Since 2002, Congress has provided funding to all U.S. states, territories, and the District of Columbia, to enhance federal, state and local preparedness for public health threats in general, and an influenza ( flu ) pandemic in particular. States were required to develop pandemic plans as a condition of this funding. This report, which will not be updated, describes an approach to the analysis of state pandemic plans, and presents the findings of that analysis. State plans that were available in July 2006 were analyzed in eight topical areas: (1) leadership and coordination; (2) surveillance and laboratory activities; (3) vaccine management; (4) antiviral drug management; (5) other disease control activities; (6) communications; (7) health care services; and (8) other essential services. A history of federal funding and requirements for state pandemic planning is provided in an Appendix. This analysis is not intended to grade or rank individual state pandemic plans or capabilities. Rather, its findings indicate that a number of challenges remain in assuring pandemic preparedness, and suggest areas that may merit added emphasis in future planning efforts. Generally, the plans analyzed here reflect their authorship by public health officials. They emphasize core public health functions such as disease detection and control. Other planning challenges, such as assuring surge capacity in the health care sector, the continuity of essential services, or the integrity of critical supply chains, may fall outside the authority of public health officials, and may require stronger engagement by emergency management officials and others in planning.

DTIC

*Emergencies; Influenza; Management Methods; Medical Services; Public Health; Supplying; Vaccines*

**20080001016** California Univ., Los Angeles, CA USA

**Arginase: A Novel Proliferative Determinant in Prostate Cancer**

Grody, Wayne W; Aug 2007; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0201

Report No.(s): AD-A472666; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472666>

This project is an investigation of the involvement of the enzyme arginase type II (AII) in the pathogenesis and growth of prostate cancer. Having cloned the AII gene in our laboratory, we unexpectedly discovered that is expressed at high levels in the normal prostate and even higher in neoplastic prostate samples. The purpose of the present research funded by USAMRMC is to examine the expression of AII in a wider range of benign and malignant prostate specimens and cultured cells to determine its usefulness as a novel marker of prostatic neoplasia and the extent of its involvement in cancer pathogenesis. We are also exploring whether specific chemical and molecular inhibitors of arginase and several related enzymes in the polyamine metabolic pathway might suppress or arrest the growth of prostate cancer cells in vitro or in vivo. This fourth annual report describes our progress over the past year in extending our characterization of arginase and other related enzymes in two new prostate cancer cell lines to address the possibility of AII and androgen susceptibility, correlating polyamine synthesis in all of the prostate cancer cell lines with AII and OAT expression, examining expression levels of polyamine biosynthetic enzymes in these cell lines, creating stable cell lines expressing AII siRNA and overexpression constructs, determining AII expression in the various prostate histological categories of a tissue microarray, and assessing genito-urinary (GU) weights for the proposed in vivo TRAMP studies.

DTIC

*Biosynthesis; Cancer; Determinants; Hormones; Males; Prostate Gland*

**20080001021** Washington Univ., Saint Louis, MO USA

**Propagation of Mammalian Prions in Yeast**

Harris, David A; Jul 2006; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0499

Report No.(s): AD-A472675; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472675>

The focus of this grant is on development of a novel model system for propagation and quantitation of mammalian prions: the budding yeast *Saccharomyces cerevisiae*. This unicellular organism offers a number of potential advantages for the study of prion biology, including rapid generation time, ease of culturing, and facile genetics. There is a strong conservation of cellular mechanisms between yeast and mammalian cells, particularly as regards the biogenesis, trafficking and localization of membrane proteins. Thus, although yeast do not express an endogenous PrP-like molecule, there are strong reasons to believe that they possess the molecular machinery to allow propagation of mammalian prions. We hypothesize that the only additional requirement is the provision of a source of membrane-anchored PrP<sup>c</sup>, the essential substrate for conversion into PrP<sup>Sc</sup>. Using *S. cerevisiae* strains that express engineered forms of PrP<sup>c</sup>, we propose to: (1) Determine whether mammalian

prions can be propagated in yeast; (2) Develop methods for titering prions in yeast; (3) Characterize the phenotype of prion-infected yeast; and (4) Identify genes that modulate prion propagation in yeast. During years 2 and 3 of the grant, we initiated a new line of investigation that makes use of PrP-expressing yeast (Task 5). This new project is aimed at investigating an intriguing and potentially important hypothesis concerning the normal, physiological function of PrPc.

DTIC

*Mammals; Yeast*

**20080001022** Utah Univ., Salt Lake City, UT USA

**Transurethral Ultrasound Diffraction Tomography**

Schabel, Matthias C; Mar 2007; 48 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0042

Report No.(s): AD-A472676; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472676>

The potential for cost-effective tomographic imaging using ultrasound continues to be confronted with difficulties arising from the computational complexity of fully three-dimensional object reconstruction in the diffraction regime. Development of fast and accurate forward and inverse models for ultrasound propagation in the biomedical frequency range of 1-10 MHz is essential for diffraction tomography to be a practical imaging modality. We have implemented a flexible, object-oriented simulation system in MATLAB for performing rapid two- and three-dimensional modeling of forward scattering using the conjugate gradient FFT method in conjunction with a fast linear adjoint approximation to the Jacobian. Nonlinear conjugate gradient inversion has been implemented and tested in both 2D and 3D, demonstrating the feasibility of the method for diffraction tomography. We have also implemented and tested several regularization schemes including L2-norm and total variation, and have used multigrid iteration in conjunction with anisotropic diffusion filtering to accelerate convergence of the inversion algorithm. Inversions of strongly scattering objects have been successfully performed in 2D and 3D, and results.

DTIC

*Cancer; Diffraction; Prostate Gland; Tomography; Ultrasonics*

**20080001023** London Univ., UK

**Risk, Psychiatry and the Modern Military**

Wessely, Simon; Apr 2006; 17 pp.; In English

Report No.(s): AD-A472679; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472679>

No abstract available

*Military Operations; Military Personnel; Psychiatry; Risk*

**20080001024** City of Hope Medical Center, Duarte, CA USA

**Mapping Interactive Cancer Susceptibility Genes in Prostate Cancer**

Krontiris, Theodore G; Larson, Garry P; Ding, Yan; Apr 2007; 33 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0255

Report No.(s): AD-A472694; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472694>

We have employed a large prostate cancer affected sibling pair cohort for candidate gene based linkage analyses. In this work we sought to enlarge a pre-existing cohort of CaP (Prostate Cancer) ASP with continued institutional recruitment of brothers affected with disease. We performed candidate gene based fine structure linkage analysis on approximately 2 dozen genes previously implicated in CaP risk. We also tested gene x gene interactions with a new paradigm based upon allele sharing enrichment. Our major finding was the localization of a susceptibility locus to intron 5 of the FHIT gene. By utilizing a combination of extensive mutation/single nucleotide polymorphism (SNP) discovery efforts in select disease cases in conjunction with linkage disequilibrium (LD) mapping and association testing we identified a SNP, rs760317, showing strong association with disease in affected brothers sharing 2 alleles identify by descent (IBD). The findings were published in 2005 and have recently been replicated by independent researchers in both a family-based Caucasian patient cohort and an African American patient cohort. Our efforts represent a significant accomplishment in the identification of a new gene associated with CaP risk as quite often promising initial linkage or association results fail to be replicated in independent studies. We continue our efforts today with the hope of finding the causative allele(s) in FHIT and it/their possible function using population genetic

tools. This represents extreme challenges as the mechanistic basis for how disease alleles residing deep within the introns contribute to disease risk.

DTIC

*Cancer; Genetics; Linkages; Nucleotides; Oncogenes; Polymorphism; Prostate Gland; Risk*

**20080001032** Alabama Univ., Birmingham, AL USA

**Polyphenols and Prostate Cancer Chemoprevention**

Lamartiniere, Coral A; Apr 2007; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0153

Report No.(s): AD-A472702; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472702>

Asians consuming a diet high in soy products have reduced incidence of clinically manifested prostate cancers. Likewise, Asians have a long history of drinking tea. Significant components of these two staples of the traditional Asian diet are the polyphenolic compounds. The primary polyphenols associated with prostate chemoprevention are the soy isoflavone, genistein, and the tea catechin, (-)-epigallocatechin-3-gallate (EGCG). Another polyphenol that has recently received attention as a cancer suppressor is resveratrol, a component of grapes. The goal of this research was to investigate the potential of these three pure polyphenols, alone and in combination, to protect against prostate cancer in a model of spontaneously developing prostate cancer model (TRAMP mice). In this manner, it may be possible to ingest moderate amount of each of these foods/chemicals, as opposed to mega amounts of one, and receive an additive or synergistic protective effect without adverse effects with possible elevated exposure.

DTIC

*Cancer; Phenols; Prostate Gland*

**20080001035** Oklahoma State Univ., Stillwater, OK USA

**Development of Aptamer Beacons for Antemortem Diagnosis of Chronic Wasting Disease**

Clinkenbeard, Kenneth D; May 2007; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0333

Report No.(s): AD-A472705; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472705>

The transmissible spongiform encephalopathies (TSE) chronic wasting disease (CWD) of elk and deer has the potential for transmission to human beings. Reliable antemortem diagnostic tests for CWD are necessary for its control in deer and elk populations. CWD and other TSEs are thought to occur when a normal cellular prion protein (PrP<sup>C</sup>) mis-folds to an aggregated and degradation resistant PrP<sup>Sc</sup> form. Development of a novel diagnostic probe termed aptamers to detect CWD was proposed. Aptamer selections were conducted against 1) tyrosyl-tyrosyl-arginine (YYR) tripeptide thought to be exposed in PrP<sup>Sc</sup> but not in PrP<sup>C</sup>, 2) CWD PrP<sup>Sc</sup>, and 3) motif grafted antibodies for two PrP motifs (provided to us by Williams laboratory at the Scripps Research Institute) believed to be involved in mis-folding of PrP<sup>C</sup> to PrP<sup>Sc</sup>. Selection with the latter two targets resulted in aptamers that recognized PrP as assessed by direct target binding assays. Although not specific for PrP<sup>Sc</sup>, aptamers selected against a grafted motifs for PrP sequences 89-112 bound to CWD PrP<sup>Sc</sup> at higher levels than to rPrP<sup>C</sup>.

DTIC

*Beacons; Diagnosis; Diseases; Infectious Diseases*

**20080001042** Stanford Univ., Stanford, CA USA

**Imaging Primary Prostate Cancer and Bone Metastasis**

Chen, Xiaoyuan; Apr 2007; 47 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0143

Report No.(s): AD-A472718; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472718>

The overall objective of the proposed research is to develop positron emitter labeled bombesin (BBN) analogs with high affinity for the GRP receptor GRPR for microPET imaging of both androgen dependent and androgen independent prostate cancer xenografted mice. Specific Aims: (1) Design, synthesize, and characterize positron emitting bombesin analogs, labeled with copper-64 or fluorine-18; (2) Conduct in vitro studies of copper-64 and fluorine-18 labeled bombesin analogs to evaluate the effect of modification and radiolabeling on the receptor binding affinity and specificity; (3) Evaluate in vivo efficacy of



these novel radiopharmaceuticals in the murine PC-3 and CWR22 human prostate cancer xenograft models. Major Findings: In year 1, we labeled Lys3-BBN with  $^{64}\text{Cu}$  for imaging both subcutaneous PC-3 (GRPR+) and CWR22 (GRPR-) tumors. In year 2, we further tested a series of BBN analogs and fully characterized  $^{64}\text{Cu}$ -DOTA-Aca-BBN(7-14). In year 3, we labeled several BBN analogs with F-18 for prostate cancer imaging. By testing a series of BBN analogs, we identified at least one  $^{18}\text{F}$ - and one  $^{64}\text{Cu}$ -labeled bombesin peptide tracers that can specifically localize to GRPR expressing tumors. These new peptide tracers have the potential to be translated into clinical settings for lesion detection and quantification of GRPR level.

DTIC  
*Bones; Cancer; Imaging Techniques; Metastasis; Prostate Gland*

**20080001044** Columbia Univ., New York, NY USA

**Design and Testing of Bi-Functional, P-Loop-Targeted MDM2 Inhibitors**

Prives, Carol L; Stockwell, Brent R; Mar 2007; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0297

Report No.(s): AD-A472723; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472723>

Our proposal is to design and evaluate a novel class of bifunctional MDM2 inhibitors, based on the discovery that nucleotides can bind to the P-loop of MDM2 and cause its relocation to the nucleolus. Such bifunctional compounds will be designed to target MDM2, but not other P-loop-containing proteins. This approach represents a new strategy for the inhibition of MDM2 function and the treatment of breast cancer. During the second year of this grant we have used the cloned, expressed, and purified GST-fused Mdm2 wild-type and C-terminally deleted RING domain protein to continue to test all commercially and privately available ATP analogs (including fluorescent analogs) for binding to Mdm2 and have further insight into the features of ATP required for binding to Mdm2. We have also (1) determined that crosslinking to 8-azido ATP inhibits ATP binding and E3 ligase activity; (2) developed high-throughput auto ubiquitination assay to discover Mdm2 ligase inhibitors (3) developed a high-throughput docking assay based on Mdm2's RING domain structure and (4) developed a high-throughput compatible luciferase-based competition assay for compounds that bind to Mdm2.

DTIC

*Breast; Cancer; Inhibitors; Mammary Glands*

**20080001046** Canadian Forces Headquarters, Ottawa, Ontario Canada

**Timing of Enhanced Post-Deployment Screening: Exploration of Participants' Preferences and of the Associations among Timing, the Prevalence of Health Problems, and the Likelihood of Referral**

Zamorski, Mark A; Apr 2006; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472728; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472728>

No abstract available

*Deployment; Health*

**20080001050** Minnesota Univ., Minneapolis, MN USA

**Dietary Phytoestrogens and Prostate Cancer Prevention**

Kurzer, Mindy S; Slaton, Joel; May 2007; 23 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0101

Report No.(s): AD-A472737; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472737>

The main objective of this project is to evaluate the effects of soy phytoestrogens on reproductive hormones and prostate tissue markers of cell proliferation and androgen action in men at high risk of prostate cancer. The hypothesis is that alteration of endogenous hormones is a mechanism by which soy phytoestrogens prevent prostate cancer. A randomized parallel arm study is being performed, in which 63 men at high risk of prostate cancer are randomized to receive one of three dietary supplements for six months: 1) soy powder containing phytoestrogens; 2) phytoestrogen-free soy powder; or 3) phytoestrogen-free milk powder. Urine and blood is collected at 0, 3 and 6 mo, for evaluation of serum hormones (testosterone, dihydrotestosterone, androstenedione, dehydroepiandrosterone, estradiol, estrone, 3,17 -androstenediol glucuronide, sex hormone binding globulin) and prostate specific antigen, as well as urinary estrogen and phytoestrogen metabolites. At 0 and 12 mo, prostate biopsies are performed to evaluate prostate tissue expression of apoptosis (TUNEL assay, Bax, Bcl-2), proliferation (Ki67, PCNA), and androgen receptor density. A pilot study is being performed to evaluate effects on protein

expression in biopsy tissue and phytoestrogen levels in expressed prostatic secretion and post-massage urine. The main study is complete: one manuscript has been accepted for publication, two other are under review, and one is preparation. The pilot study is continuing with funding from the University of Minnesota.

DTIC

*Cancer; Diets; Prevention; Prostate Gland*

**20080001055** Johns Hopkins Univ., Baltimore, MD USA

**Prostate Cancer Detection by Molecular Urinalysis**

Pavlovich, Christian P; Chan, David Y; Apr 2007; 12 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0167

Report No.(s): AD-A472745; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472745>

Prostate cancer is the most commonly diagnosed cancer and the second leading cause of cancer-related death in the USA. The most common DNA alteration associated with prostate cancer is hypermethylation in the regulatory region of certain genes, particularly in the promoter of the pi-class glutathione- 5-transferase (GSTP1) gene. Analysis of hypermethylation of other gene promoters in combination has demonstrated high sensitivity and specificity for prostate cancer diagnosis. In this project, we evaluate the feasibility of detection of prostate cancer by molecular urinalysis. Prostatic manipulation from sources such as a biopsy needle, transrectal ultrasound (TRUS) probe, or digital rectal exam (DRE), may cause prostatic DNA to appear in the urine by shedding of neoplastic cells or debris into the prostatic ducts and urethra. The specific impact of prostatic manipulation on the detection of DNA promoter hypermethylation in the urine is unclear, as there are no studies comparing urine obtained before and after prostatic manipulation in identical patients. We hypothesized that voided urine specimens from patients with prostate cancer would be more likely to have detectable DNA promoter hypermethylation immediately after prostate manipulation by TRUS-guided needle biopsy than after DRE. We have compared voided urine samples obtained after extended (15-second) DRE with voided urine samples obtained after TRUS-guided needle prostate biopsy from patients with suspected or confirmed prostate cancer using conventional methylation-specific PCR (MSP) analysis to examine the hypermethylation status of three different gene promoters: GSTP1, APC and EDNRB. These loci were chosen because of their high frequency of methylation in prostate cancer specimens. Methylation analysis at multiple genes has also been shown to have diagnostic and prognostic value in prostate cancer.

DTIC

*Cancer; Prostate Gland; Urinalysis*

**20080001057** Michigan Univ., Ann Arbor, MI USA

**Role of the XIAP/AIF Axis in the Development and Progression of Prostate Cancer**

Wilkinson, John C; Mar 2007; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0854

Report No.(s): AD-A472756; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472756>

Over the project period, significant progress was made towards completing the tasks outlined in the original Statement of Work. The physical association between XIAP and AIF was confirmed in living cells, and was determined to be highly dependant upon the ubiquitination status of AIF. This interaction could be disrupted by Smac/DIABLO, in a manner that correlated with AIF ubiquitination. AIF was shown to be a substrate for XIAP-mediated ubiquitination, which did not result in AIF degradation. The caspase inhibitory properties of XIAP were found to be insensitive to AIF expression and dispensable for AIF binding. AIF overexpression resulted in significant increases in cellular reactive oxygen species levels that were not attenuated by co-expression of XIAP. It was shown that the XIAP antagonist and serine protease Omi/HtrA2 was capable of cleaving AIF, yet the loss of Omi/HtrA2 did not affect the cytoplasmic release of AIF during apoptosis. Finally, AIF was found to associate with the XIAP homologues cIAP-I and cIAP-2, suggesting that AIF may be a general purpose IAP binding protein. Taken together, these findings not only confirm the physiological relevance of the association between XIAP and AIF, but also establish a functional link between XIAP and AIF, and form the basis for understanding how these two molecules contribute to the development and progression of prostate cancer.

DTIC

*Cancer; Prostate Gland*

**20080001058** Minnesota Univ., Minneapolis, MN USA

**Effect of Dietary Intervention on Prostate Tumor Development in TRAMP Mice**

Cleary, Margot P; May 2007; 31 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0258

Report No.(s): AD-A472757; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472757>

Calorie restriction has been reported to protect rodents from many different cancers. With respect to prostate cancer, a protective effect of energy restriction on development of spontaneous prostate tumors in Lobund-Wistar rats and tumors developing from transplanted prostate tumor tissue or cells in mice and rats has been published. However we have found that in female rodents intermittent caloric restriction is more protective than chronic restriction in preventing transgenic mammary tumor development. Here, we determined how intermittent versus chronic calorie restricted affected development of prostate cancer in transgenic TRAMP mice. A 25% reduction in caloric intake was utilized. Intermittent-restricted mice had significant delay in the age of tumor detection and age at death compared to ad libitum and chronic restricted mice. Serum leptin to adiponectin ratio was lower following intermittent restriction and may indicate an environment that inhibits cell proliferation. In tumor and genital-urinary tissue we are attempting to identify metabolic pathways to target for prevention and/ treatment strategies. In particular we are assessing aspects of the IGF-I, adiponectin and leptin axes. The results of this study provide further evidence that the manner in which calories are consumed has a significant impact of development of some malignancies.

DTIC

*Cancer; Diets; Mice; Prostate Gland; Tumors*

**20080001062** Alabama Univ., Birmingham, AL USA

**A Double Selection Approach to Achieve Specific Expression of Toxin Genes for Ovarian Cancer Gene Therapy**

Curiel, David T; Siegal, Gene; Wang, Minghui; Nov 2006; 109 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0035

Report No.(s): AD-A472761; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472761>

Gene therapy is a novel treatment modality which offers great potential for the control of carcinoma of the ovary. The efficacy of such approaches, however, is currently limited due to the inability of available gene delivery vehicles (vectors) to achieve efficient and selective gene transfer to target tumor cells. Proposed herein is a strategy to modify one candidate vector, recombinant adenovirus, such that it embodies the requisite properties of efficacy and specificity required for ovarian cancer gene therapy. This approach is based on targeting the delivered anti-cancer gene to tumor via two complimentary approaches. This strategy is based upon restricting the expression of the anti-cancer gene exclusively to ovarian cancer tumor cells ('transductional targeting') plus directing the binding of the viral vector particle exclusively to tumor cells ('transductional targeting'). This 'double targeting' approach is highly novel. We have advanced this double targeting approach in the current period. In the first regard, we have improved the infectivity of adenovirus (Ad) for ovarian cancer targets via a knob 'switch' method exploiting fiber knobs of canine and ovine Ad fiber knobs. In the second instance, we have defined optimized tumor selective promoters for ovarian cancer (TSPs). In this period we have shown the utility of both of these modifications to improve adenovirus targeting for ovarian tumor cells in vitro and in vivo. These studies have provided the framework for testing our overall concept in the future funding period, for ascertaining therapeutic gains of double targeting in murine models of carcinoma of the ovary.

DTIC

*Cancer; Gene Therapy; Genes; Ovaries; Toxins and Antitoxins*

**20080001063** Virginia Univ., Charlottesville, VA USA

**Nuclear Imaging for Assessment of Prostate Cancer Gene Therapy**

Pan, Dongfeng; Mar 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0261

Report No.(s): AD-A472763; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472763>

Background: Combination of the cytotoxic viral thymidine kinase (tk) and the prodrug acyclovir (ACV) has been reported to inhibit the growth of the C4-2 tumor a subline of LNCaP. However it remains unsolved to non-invasively detect the in vivo distribution expression and persistence of the toxic gene as well as to evaluate the therapeutic effect. In this project we will develop a nuclear gene imaging approach to assist the cytotoxic gene therapy study for prostate cancer. Objective/Hypothesis:

The distribution expression and persistence of the prostate specific Ad-PSA-tk in the C4-2 tumor xenograft model will be non-invasively and repeatedly determined in vivo by tracing the radiolabeled TK substrates with a SPECT imaging modality. Specific Aim of the first year: To synthesize a radiolabeled TK substrate 2'-Deoxy-2' fluoro-5-(oxo[N,N-bis(2-mercaptoethyl)ethylenediaminato] [Tc-99m] technetium(V)-1 (E)-propenyl}uridine for TK detection using a small animal gamma detector. Progress and outcome: In last report of 2003 which covers from September of 2002 to March of 2003 we reported our efforts to synthesize fragments A and B. In this report we successfully linked the radiometal chelator with fluorothymidine. We will characterize the structure of the final tracer and test the pharmacokinetics and pharmacodynamics of the tracer in next research year. Also the Adenoviral vectors with reporter genes of tk and luciferase were constructed. The luciferase gene expression in live mouse model was non-invasively imaged and the result was posted in 2003 Annual Meeting of ASGT (American Society of Gene Therapy).

DTIC

*Cancer; Gene Therapy; Imaging Techniques; Pharmacology; Prostate Gland*

**20080001064** Baltimore Univ., MD USA

**Magnetic Resonance Imaging of Polymeric Drug Delivery Systems in Breast Cancer Solid Tumors**

Zarabi, Bahar; Ghandehari, Hamid; Jul 2007; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0341

Report No.(s): AD-A472764; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472764>

The overall purpose of this research is to develop a polymeric drug delivery system containing magnetic resonance contrast agents for the treatment of breast cancer. This drug-imaging agent delivery system will allow the follow up of the fate of the drug delivery system and its relation to reduced tumor mass, improved efficacy and reduced toxicity in individual patients. In three years, progress was made in the following areas: 1) Synthesis, characterization, relaxivity and stability measurements of polymer-nitroxide/dinitroxide conjugates. 2) Synthesis, characterization, relaxivity measurement, pH stability measurement, challenge study in the presence of a different chelator and cytotoxicity test of polymer-gadolinium conjugates with and without doxorubicin on cancerous and non-cancerous cell lines. In addition, a series of polymer-contrast agent conjugates targetable to macrophages were synthesized, characterized, and evaluated in vitro. A no cost extension is requested to complete the project.

DTIC

*Breast; Cancer; Drugs; Imaging Techniques; Magnetic Resonance; Mammary Glands; Tumors*

**20080001144** Georgetown Univ., Washington, DC USA

**Endocrine Therapy of Breast Cancer**

Clarke, Robert; Jun 2007; 65 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0570

Report No.(s): AD-A472777; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A recent controversy in the treatment of estrogen receptor positive (ER+) breast cancers is whether an aromatase inhibitor, e.g., letrozole (LET) or TAM should be given as first line endocrine therapy. Unfortunately, response rates are lower, and response durations are shorter, on crossover than when these agents are given as first line therapies, e.g., ~40% of tumors show crossresistance to TAM or an aromatase inhibitor on crossover. Only 50% of ER+ tumors respond to endocrine therapy. Currently, we fail to predict endocrine responsiveness in about 66% of ER+/PgR- (progesterone receptor), 55% of ER-/PgR+, and 25% of ER+/PgR+ tumors. In this new Clinical Translational Research Award, we hypothesize that our analytical methods can extract expression profiles of breast tumors that define their responsiveness (sensitive vs. resistant) to endocrine therapy. These profiles, when combined with known predictive/prognostic factors, will support neural network and biostatistical classifiers or committee machines that predict each tumor's endocrine responsiveness. Our objectives are to array breast cancer cases, build classifiers of endocrine responsiveness (using microarray data), and validate these classifiers in independent data sets. In the long term, we will design custom arrays for use in clinical practice. Genes will be further studied using cellular and molecular methods, and their role as therapeutic targets explored.

DTIC

*Breast; Cancer; Endocrine Glands; Endocrinology; Mammary Glands; Therapy*

**20080001152** Nebraska Univ., Omaha, NE USA

**Biomarker Based Individual Risk Assessment for Prostate Cancer**

Hemstreet, III, George P; Sep 2005; 65 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0121

Report No.(s): AD-A472804; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There is a surprising disparity between the number of protein-encoding genes (ca. 30,000) in the human genome and the number of proteins (ca. 300,000) in the human proteome has inspired the development of translational proteomics aimed at protein expression profiling of disease states. Translational proteomics, which offers the promise of early disease detection and individualized therapy, requires new methods for analysis of clinical specimens. We have developed Quantitative Fluorescence Imaging Analysis (QFIA) for accurate, reproducible quantification of proteins in slide-mounted tissues. The method has been validated for analysis of beta-catenin in archived prostate specimens fixed in formalin. beta-catenin expression was analyzed in a cross-sectional case-control study that included 42 cancer cases and 42 controls matched on the basis of age ( 5 years) and year of biopsy ( 3 years). Reduced expression of beta-catenin in Normal Appearing Acini (NAA) relative to the Normal Acini (NA) of matched controls is a potential field marker for Prostate Cancer, in biopsies that miss existing adenocarcinomas. The observed sensitivity (42%) and specificity (88%) qualify the marker as a potentially significant contributor to a small panel of field markers, and support the feasibility of applying QFIA to the development of such a panel.

DTIC

*Assessments; Biomarkers; Cancer; Clinical Medicine; Prostate Gland; Risk*

**20080001153** Chicago Univ., Chicago, IL USA

**Evaluation of the Role of the Metastasis-Suppressor Gene MKK4/SEK1 in Transgenic Models of Prostate Cancer**

Rinker-Schaeffer, Carrie W; Jun 2005; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0700

Report No.(s): AD-A472805; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Metastasis-suppressor genes suppress the growth of metastases without affecting tumor growth. We have been studying the role of inactivation of one such metastasis suppressor gene, Map Kinase Kinase 4 (MKK4) in the process of metastatic colonization. Work proposed in this application was aimed at extending our ongoing studies in the AT6.1 model system into established transgenic models of prostate cancer and the use of transgenic approaches to test further MKK4's metastasis suppressor activity. Over the finding period of this grant we worked to test our hypotheses appropriately. During the course of these studies we found a need for changing our experimental design. To address these we established new collaborations and re-examined the potential role of MKK4 in tumorigenesis in both the TRAMP model and human cancers. In pursuing these studies we identified an unanticipated role MKK4 in the early growth of primary tumors and disseminated cells at metastatic sites.

DTIC

*Cancer; Genes; Metastasis; Prostate Gland; Suppressors; Vaccines*

**20080001160** Hospital D'Instruction des Armees Du Val-De-Grace, Paris, France

**Etude Exploratoire sur l'Etat de Stress Post-Traumatique dans Deux Unites Operationnelles de l'Armee de Terre (Exploratory Study of the Condition of Post-Traumatic Stress Disorder from Two Operational Units of Ground Forces)**

Vallet, D; Arvers, P; Apr 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472827; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Injuries; Military Personnel*

**20080001168** Thomas Jefferson Univ., Philadelphia, PA USA

**Ultrasound Activated Contrast Imaging for Prostate Cancer Detection**

Forsberg, Flemming; Mar 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0119

Report No.(s): AD-A472860; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The current project proposes to develop a novel ultrasound contrast imaging technique (called EEI) for better visualization of the microvessels, which are characteristic of the neovasculature associated with prostate cancer. In vitro, Sonazoid produced 10dB of enhancement at 22 deg C, which reduced to 5dB at 37 deg C. Conversely, Optison created 1dB of enhancement at 22 deg C, which increased to 9dB at 37 degC. This enhancement reduced to 3dB when the concentration was increased from

0.05 to 0.5pl/l. While no enhancement was found for Definity at any of the concentrations studied, QFX produced approximately 17 and 14dB of enhancement at the fundamental and harmonic frequencies, respectively. Initial simulation results indicate that the shell elasticity plays a vital role in the growth as well as dissolution of the bubbles. While results at an imaging frequency of 7.5MHz were somewhat in agreement with measurements, the enhancement was unrealistically high (20-35dB). Somewhat disappointingly only 1-4dB of enhancement was produced by EEI in vivo. In conclusion, up to 17dB of enhancement can be achieved with EEI in vitro. However, EEI appears to be quite sensitive to changes in temperature and microbubble concentration, which may explain the reduced enhancement observed in vivo.

DTIC

*Cancer; Imaging Techniques; Prostate Gland; Ultrasonics*

**20080001171** Miami Univ., FL USA

**2-Methoxyestradiol as a Chemotherapeutic for Prostate Cancer**

Perez-Stable, Carlos; Apr 2007; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0179

Report No.(s): AD-A472868; No Copyright; Avail.: Defense Technical Information Center (DTIC)

2-Methoxyestradiol (2-ME) is an endogenous metabolite of estradiol with promise for cancer chemotherapy including advanced prostate cancer. Our hypothesis is one of the cancer-specific mechanisms whereby 2-ME exerts its anti-prostate cancer activity is the deregulated activation of cyclin BI/cdk1 kinase during the cell cycle which results in the induction of apoptotic cell death. Several experimental results support this hypothesis: 1) there is a positive correlation between the levels of cyclin BI protein and the ability of 2-ME to increase apoptosis in prostate cancer cells; 2) overexpression of cyclin BI increases 2-ME-mediated apoptosis while inhibition of cdk1 activity lowers 2-ME-mediated apoptosis; 3) 10w doses of 2-ME and docetaxel can increase G2/M cell cycle arrest and apoptosis in prostate cancer cell lines and in the GyIT transgenic mouse model of prostate cancer greater than either drug alone. We conclude that 2-ME can increase apoptosis in prostate cancer cells because of the expression of cyclin BI prntein which is minimally expressed in normal cells.

DTIC

*Cancer; Chemotherapy; Prostate Gland*

**20080001172** Northern California Inst. for Research and Education, San Francisco, CA USA

**The Role of the Y-Located TSPY Gene in Prostatic Oncogenesis**

Lau, Yun-Fai C; Feb 1, 2007; 153 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0081

Report No.(s): AD-A472869; No Copyright; Avail.: Defense Technical Information Center (DTIC)

TSPY is the putative gene for the gonadoblastoma locus on the Y chromosome (GBY). It is aberrantly expressed in and could contribute to prostate cancer. The objectives of the project are: 1) to identify the oncogenic and/or tumor promoting properties of TSPY and 2) to correlate TSPY over-expression with prostatic oncogenesis in transgenic mice. During the funded penod we confirmed the involvement of TSPY in the initiation and/or early stages of prostate cancer and germ cell tumors. Ectopic TSPY expression potentiates cell proliferation (by shortening the G2/M phase) and tumor growth in nude mice leading to genome instability and gene dysregulation. Numerous oncogenes were up regulated and growth inhibitors were repressed in these TSPY-expressing cells. TSPY binds to cyclin B and exerts activating effects on cyclin B-CDK1 kinase activities. TSPY interacts with the elongation factor IA thereby enhancing the protein synthetic machinery and exacerbating tumor cell growth. TSPY transgene was expressed in the hyperplasic region in the prostates of transgenic mice thereby supporting its role(s) in either the initiation and/or early stages of prostatic carcinogenesis. Our results have provided significant insights on the role of TSPY in prostatic oncogenesis and development of diagnostic therapeutic and preventive strategies for prostate cancer.

DTIC

*Cancer; Prostate Gland; Tumors*

**20080001176** Arizona Univ., Tucson, AZ USA

**Enhancement of Dendritic Cell-Based Immunotherapy Using a Small Molecule TGF-beta Receptor Type I Kinase Inhibitor**

Rausch, Matthew P; Jul 2007; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0438

Report No.(s): AD-A472882; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Dendritic cells (DC) have become particularly attractive candidates for cancer immunotherapy due to their potent ability

to stimulate antigen specific T cells responses. A number of pre-clinical and clinical studies using tumor antigen-pulsed DCs to treat a variety of malignancies have demonstrated that DC vaccines can elicit measurable cellular anti-tumor immunity. However, despite these encouraging results, DC-based immunotherapy has demonstrated only limited clinical success in the treatment of established tumors. The limited clinical efficacy of existing DC-based cancer vaccines has been attributed in part to suppressive factors produced by the growing tumor, such as transforming growth factor-beta (TGF- ) that has been shown to impair the immunostimulatory capacity of DCs. Therefore, strategies to neutralize the deleterious effects of TGF- may lead to more effective DC-based cancer therapies. HTS466284 and SM16 are potent small molecule TGF- receptor type I (T RI) kinase inhibitors that have been shown to block TGF- signaling by binding to the ATP-binding pocket of this receptor. The hypothesis to be tested is that T RI kinase inhibitor therapy will enhance the efficacy of DC vaccines in the treatment of established murine mammary tumors by rendering DCs resistant to TGF- -mediated immunosuppression. The specific aims of the project are to: 1) Determine the effect of T RI kinase inhibitors on spontaneous tumor metastasis, 2) Evaluate the effect of the combination T RI kinase inhibitors plus DC vaccination on the treatment of primary and metastatic breast cancer, 3) Evaluate the role of immune effector cells in the anti-tumor response following combination therapy with T RI kinase inhibitors and DC vaccines.

DTIC

*Augmentation; Crystal Structure; Dendritic Crystals; Enzyme Activity*

**20080001177** California Univ., Berkeley, CA USA

**Regulation of hTERT Expression and Function in Newly Immortalized p53(+) Human Mammary Epithelial Cell Lines**

Stampfer, Martha R; Jun 2007; 110 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0580

Report No.(s): AD-A472883; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Telomerase is reactivated in almost all human breast cancers; loss of telomeric protection can lead to genomic instability. This proposal is to study telomerase reactivation and telomere protection in newly immortal, p53+ human mammary epithelial cells (HMEC), and to determine if these cells may be especially sensitive to therapies that target telomerase activity and telomere protection. Prior work showed that p53 can suppress most, but not all, telomerase expression in newly immortal p53+ HMEC lines until telomeres become extremely short, when an unknown mechanism (termed conversion) relieves this repression. We hypothesized that the observed upregulation of cyclin-dependent kinase inhibitor p57 might protect cells with critically short telomeres by inhibiting growth until there is sufficient telomerase to protect the telomeric ends. Our research in the past year supports a role of p57 in arresting growth prior to a p53-mediated DNA damage response being evoked, as well as a novel role in telomere homeostasis. Inhibition of p57 produced a result similar to inhibition of telomerase - accelerated, complete growth arrest without telomerase reactivation. Unlike telomerase inhibition, p57 inhibition led to a p53-mediated DNA damage arrest. Our data support a potential role for inhibition of p57 and/or telomerase in preferentially killing newly immortal p53+ HMEC.

DTIC

*Breast; Cancer; Homeostasis; Mammary Glands*

**20080001178** Michigan Univ., Ann Arbor, MI USA

**Development of a Computer-Aided Diagnosis System for Early Detection of Masses Using Retrospectively Detected Cancers on Prior Mammograms**

Wei, Jun; Jun 1, 2007; 85 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0475

Report No.(s): AD-A472884; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project is to develop a computer-aided diagnosis (CAD) system for mass detection using advanced computer vision techniques that will be trained with retrospectively detected cancers on prior mammograms. The new CAD system will be combined with our existing CAD system. When fully developed, the new dual CAD system should increase the sensitivity of detecting cancers at the early stage without compromising the sensitivity for other cancers. During this project year, we have performed the following tasks: (1) continue to collect the data sets of digitized film mammograms for testing our CAD system, (2) investigation of a bilateral approach to reduce the false positives (FPs) on single CAD system, (3) develop image processing techniques for improvement of mass detection on prior mammograms, and (4) continue to develop a two-view information fusion method to improve the performance of single CAD system. In summary, we have investigated a number of areas in CAD of mammographic masses and evaluated the new techniques for mass detection on mammograms. We have made progress in three of the tasks proposed in the project. We have found that our new

computer-vision techniques can improve the performance of the CAD systems. We will continue the development of the CAD system in the coming years.

DTIC

*Breast; Cancer; Computer Techniques; Computer Vision; Detection; Diagnosis; Mammary Glands*

**20080001179** University Health Network, Toronto, Ontario Canada

**A Study of Transrectal Tumor Oxygen Measurements in Patients with Clinically Localized Prostate Cancer**

Milosevic, Michael; Toi, Ants; Sweet, Joan; Bristow, Robert; Hedley, David; Panzarella, Tony; Hill, Richard; Aug 2006; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0111

Report No.(s): AD-A472885; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study of tumor hypoxia in prostate cancer patients has completed accrual and has yielded the largest cohort of its type world-wide. It has provided valuable information about the distribution of hypoxia in both malignant and non-malignant regions of the prostate gland the relationship between hypoxia and other important clinical and surgico-pathologic prognostic factors and the impact of androgen withdrawal on prostate cancer hypoxia. It has also provided a unique platform for investigating intrinsic biologic markers of tumors hypoxia and the relationship between hypoxia DNA repair and radioresistance in a truly relevant clinical context. Information about the relationship between hypoxia and patient outcome will follow at a later time once sufficient patient follow-up is achieved.

DTIC

*Cancer; Hypoxia; Oxygen; Patients; Prostate Gland; Tumors*

**20080001180** Charles R. Drew Univ. of Medicine and Science, Los Angeles, CA USA

**DREW-UCLA Breast Cancer Research and Training Program: Molecular/Cellular Pathogenesis Model**

Vadgama, Jaydutt; Mar 2007; 124 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0340

Report No.(s): AD-A472889; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Objective: The overarching goals of this partnership between Charles F. Drew University of Medicine and Science (Drew) and the University of California Los Angeles Jonsson Comprehensive Cancer Center (UCLA-JCCC) are to develop Drew faculty into independent and competitive investigators and in turn, provide Drew with the necessary capacity to establish a breast cancer research program with a focus on minority and underserved populations. We have generated significant progress toward the following objectives: 1) We have created a Cancer Cluster at Drew that brings together various investigators engaged or have interest in Cancer Research, Education, Training, and Treatment. This Cluster group has enabled us to identify senior, mid-level, and junior faculty who can be partnered with established breast cancer investigators at UCLA as senior mentors or research collaborators. 2) We have created an educational experience and mentored research environment that fosters breast cancer research and offers substantive training to Drew (HBCU/MI) faculty and postdoctoral fellows. 3) We have created opportunities for Drew faculty, fellows and students to access UCLA-JCCC and Drew shared resources. 4) We have generated exciting data that identifies novel genes that may be associated with HER2/neu overexpressing breast tumors. In particular, candidate genes that may be associated with resistant to Trastuzumab treatment.

DTIC

*Breast; Cancer; Education; Mammary Glands; Pathogenesis*

**20080001189** Virginia Univ., Charlottesville, VA USA

**Effect of a High Bone Turnover State Induced by Estrogen Deficiency on the Development and Progression of Breast Cancer Metastases**

Kozlow, Wende M; Apr 2007; 72 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0311

Report No.(s): AD-A472923; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Aromatase inhibitors (AIs) effective treatment for breast cancer block estrogen synthesis. Increased bone resorption and decreased bone mineral density (BMD) are predicted consequences. We hypothesized that bisphosphonates (BPs) may prevent bone loss from AI therapy. Four-week-old female nude mice were treated with letrozole (10 mcg/d) zoledronic acid (ZA) (5 mcg/kg twice weekly) letrozole + ZA or control. Mice treated with letrozole alone had lower BMD compared to control ( $p < 0.0001$ ; total body spine femur and tibia). Mice treated with ZA alone had higher BMD compared to control ( $p < 0.0001$ ; total body spine femur and tibia). MicroCT analysis of the tibia showed no difference in trabecular bone volume (BV/TV) or



trabecular number thickness or spacing in mice treated with letrozole compared to control. Treatment with ZA (+1- letrozole) resulted in a significant increase in BV/TV and trabecular number and thickness and the structural model index indicated that the bone structure was unusually solid. ZA prevented Al-induced bone loss but microCT and dynamic bone histomorphometry suggest reduced bone remodeling. BPs may be useful to prevent Al-induced bone loss but further studies are needed to assess the effects of these treatments on bone quality.

DTIC

*Bones; Breast; Cancer; Estrogens; Histology; Mammary Glands; Metastasis; Replacing; Spine*

**20080001190** TRUE Research Foundation, San Antonio, TX USA

**Development and Evaluation of New Products for the Far-Forward Care of Combat Casualties With Acute Lung Injury**

Cancio, Leopoldo C; Hattler, Brack; Batchinsky, Andriy I; Feb 2007; 21 pp.; In English; Original contains color illustrations  
Contract(s)/Grant(s): DAMD17-03-2-0016

Report No.(s): AD-A472924; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The principal objective for this phase of the study was to develop a new method of delivering chlorine gas for inhalation injury in sheep. Secondary objectives included the following: to assess the utility of the Suffolk breed of sheep for studies of inhalation injury; to demonstrate Optical Coherence Tomography (OCT) imaging of the trachea and bronchi following inhalation of chlorine, and to demonstrate Near-Infrared Diffuse Optical Spectroscopy (NIRS-DOS) monitoring of sheep following chlorine inhalation injury. HYPOTHESIS: Inhalation injury can be reliably produced by means of inhalation of chlorine gas by mechanical ventilation. RESULTS: Two hours following ventilation with 100 or 150 ppm chlorine in air, 300 liters total volume over 30 min, the mean+-SD PaO<sub>2</sub>-to-FIO<sub>2</sub> ratio was 110+-47 and the mean+-SD survival time was 37+-39 hrs. All animals developed acute respiratory distress syndrome (ARDS) by 2 hrs. after injury. Suffolk appeared to be more vulnerable to injury than the crossbred sheep previously used. OCT imaging showed minimal changes in the tracheal and bronchial mucosa and submucosa, consistent with the predominantly alveolar-capillary membrane level of this injury. NIRS-DOS showed decreases in tissue oxygen saturation (StO<sub>2</sub>) with injury. CONCLUSION: Delivery of chlorine by mechanical ventilation reliably caused ARDS in all animals studied. OCT was an excellent way to image the large airways non-invasively. NIRS-DOS enabled non invasive measurement of StO<sub>2</sub>.

DTIC

*Catheterization; Chlorine; Combat; Injuries; Lungs; Medical Equipment; Oxygen; Product Development*

**20080001191** General Accounting Office, Washington, DC USA

**Global Health: U.S. Agencies Support Programs to Build Overseas Capacity for Infectious Disease Surveillance**

Sep 2007; 58 pp.; In English

Report No.(s): AD-A472925; GAO-07-1186; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The rapid spread of severe acute respiratory syndrome (SARS) in 2003 shows that disease outbreaks pose a threat beyond the borders of the country where they originate. Over the past decade, the USA has initiated a broad effort to ensure that countries can detect any disease outbreaks that may constitute a public health emergency of international concern. Three U.S. agencies the Centers for Disease Control and Prevention (CDC), the U.S. Agency for International Development (USAID), and the Department of Defense (DOD) support programs aimed at building this broader capacity to detect a variety of infectious diseases.

DTIC

*Infectious Diseases; Surveillance*

**20080001199** Pennsylvania Univ., Philadelphia, PA USA

**A Novel Method for Determining Calcification Composition**

Maidment, Andrew D; Dec 2005; 43 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0465

Report No.(s): AD-A472940; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Breast calcifications can be divided into two broad categories. Type I are composed of calcium oxylate while type II calcifications all have some phosphorus content most typically calcium hydroxyapatite. Type II calcifications are known to be associated with carcinoma while it is generally accepted that the exclusive finding of type I calcifications is indicative of benign lesions. We have developed a technique that will determine the composition of calcifications based on x-ray coherent scatter (analogous to x-ray diffraction). In this grant we have designed a dedicated coherent scatter imaging system. We have

characterized the design and optimized the system. We have developed calibration methods and used these to identify the chemical composition of calcific materials *ex vivo*. We have also evaluated the potential to image materials *in vivo*. However due to physical limitations we believe that development of an *in vivo* system is unlikely. We believe that this methodology has the most value as a screen process in the histological evaluation of specimens.

DTIC

*Breast; Calcification; Cancer; Mammary Glands*

**20080001202** Florida Univ., Gainesville, FL USA

**Evaluation of New Technologies for Protection of Military Personnel from Filth and Biting Flies**

Koehler, Philip G; Patterson, Richard S; Oct 2007; 241 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0868

Report No.(s): AD-A472944; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Filth flies serve as vectors for many diseases that pose a serious threat to the safety and well-being of deployed military personnel. Our research project targeted the development of new insecticides for fly control. During the 3-year research project, research on control of mosquitoes and flies developed from the initial screening of insecticidal active ingredients to a field testing of new formulation and new application devices. We obtained several insecticides including pyrethroids, neonicotinoids, phenylpyrazoles, oxadiazines, and organophosphates and screened them against flies. We tested fly traps and light traps to optimize military usage of these non-chemical controls. A sprayable spot fly bait was evaluated and proved to be very useful for use by deployed troops. After our studies and recommendation the product received NSN (01-555-9369) and is available for use by military entomologists. New volatile compounds were tested against both flies and mosquitoes, and demonstrated to be useful for control of mosquitoes and flies in confined areas. Insecticide-impregnated wool cords were shown to be the best material for delivery of the insecticides to flies, because an efficient acquisition of pesticide by the insects from wool cords, possibly due to presence of natural oils. The grant supported six graduate students, three of them military entomologists.

DTIC

*Insecticides; Insects; Military Personnel; Protection*

**20080001249** Jordan (Edward. C.) Co., Inc., Portland, ME USA

**Health and Safety Plan Data Item A009. Hamilton Army Airfield, Novato, California**

Guay, Marcel; Plante, Thomas; Nov 1990; 149 pp.; In English

Contract(s)/Grant(s): DAAA15-88-D-0006

Report No.(s): AD-A473038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

E.C. Jordan has prepared a Health and Safety Plan for conducting an Environmental Investigation/Alternative Assessment at the base closure portion of Hamilton Army Airfield. This document was prepared under contract to the U.S. Army Toxic and Hazardous Materials Agency, Base Closure Division. The work plan is being developed for the purpose of gathering sufficient information to allow a comprehensive evaluation of the environmental conditions which exist at the base closure portion of Hamilton Army Airfield from a property transfer perspective.

DTIC

*Environment Management; Health; Military Air Facilities; Public Health; Safety*

**20080001431** Chung Yuan Christian Univ., Chung-Li, Taiwan, Province of China

**Identification the Microbial Diversity in a Municipal Wastewater Treatment Plant Using Non-Cultured Based Methods**

You, Sheng-Jie; Ouyang, Chaio-Fuei; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 431-440; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC93-2211-E-033-004; Copyright; Avail.: Other Sources

In this study, the microbial diversity of activated sludge and RBC (rotating biological contactor) biofilm at Taipei Min-Sheng Municipal Wastewater Treatment Plant was investigated by a combined cloning-DGGE (denaturing gradient gel electrophoresis) method. The microbial diversity showed that *Pseudomonas spinosa*, *Zoogloea ramigera* and *Streptococcus penumoniae* were the most predominant types of bacteria in the activated sludge, and in the first and fourth stages of the rotational biological contactor biofilm, respectively. The phylogenetic tree revealed that all the microbial community of these three samples could be divided into three linkages. Among these three linkages, one contained the most clones from rotational biological contactor samples, while others contained the most activated sludge clones. A higher abundance of filamentous bacteria was identified in the fourth stage of the rotational biological contactor biofilm. Additionally, among the three samples,

the nitrifying bacteria and nitrification phenomenon were only observed in the fourth stage of the rotational biological contactor biofilm.

Author

*Activated Sludge; Microorganisms; Waste Water; Biomarkers; Deoxyribonucleic Acid*

**20080001433** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**Effects of Obstacle Height on the Control of the Body Center of Mass Motion during Obstructed Gait**

Wang, Ting-Ming; Chen, Hao-Ling; Lu, Tung-Wu; Journal of the Chinese Institute of Engineers, Volume 30, No. 3; May 2007, pp. 471-479; In English; See also [20080001415](#)

Contract(s)/Grant(s): NSC96-2320-B002-023; NHRI-EX91-9126EP; Copyright; Avail.: Other Sources

Tripping over obstacles has been reported as one of the most frequent causes of falls in the elderly. Since a successful crossing requires the stability of the body through the control of the motion of the body center of mass (COM), the purpose of this study was to investigate the COM motion when crossing obstacles of different heights. Ten young healthy adults walked and crossed obstacles of heights of 10%, 20% and 30% of their leg lengths in a gait laboratory. The COM motions were calculated using data measured from a motion analysis system. It was found that vertical motions of the COM, including position, velocity and acceleration, were all modulated to successfully cross obstacles of different height. All acceleration components of the COM were changed with increased obstacle height, suggesting that different forces from muscle contractions were needed to control COM stability when facing different obstacle heights. These findings may help shed light on further investigation of the motor control strategies of the central nervous system for obstacle crossing and serve as baseline data in the evaluation of the elderly and patients.

Author

*Age Factor; Center of Mass; Control Stability; Height; Center of Gravity*

**20080001495** Defence Research and Development Suffield, Suffield, Alberta Canada

**Expression of Bacillus anthracis Protective Antigen in Bacillus megaterium**

Berger, B J; Schwandt, K E; Radford, C L; Mar 2004; 29 pp.; In English

Contract(s)/Grant(s): CBD-01-013

Report No.(s): AD-A472913; DRDC SUFFIELD-TM2004-045; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bacillus anthracis protective antigen is the central component of the anthrax toxin complexes that facilitates entry of lethal factor and edema factor into host cells. Protective antigen is also the major immunogenic component present in the currently licensed anthrax vaccine. In order to produce full-length, soluble protective antigen, the gene has been cloned and expressed using Bacillus megaterium and a xylose-inducible heterologous expression system. After only 3.5 hours growth post-induction in Luria-Bertani broth, the transgenic B. megaterium were found to secrete approximately 1 mug/ml protective antigen into the culture medium. The recombinant protein was easily purified to homogeneity in a single step by ion exchange chromatography. N-terminal amino acid sequencing of the final product confirmed that the recombinant protective antigen was full-length and that no proteolytic degradation had occurred.

DTIC

*Antigens; Bacillus; Infectious Diseases*

**20080001500** Defence Research and Development Suffield, Suffield, Alberta Canada

**Gene Knockdown of Venezuelan Equine Encephalitis Virus E2 Glycoprotein Using DNA-Directed RNA Interference**

Bhagal, H S; McLaws, L J; Jager, S J; Dec 2006; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472803; DRDC-S-TM-2006-242; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Venezuelan equine encephalitis virus is an important veterinary and human pathogen that also has the potential to be used as a bioterrorist agent. Since there are no approved vaccines or antiviral drugs for this virus, it is prudent that antiviral strategies be developed. RNA interference, an evolutionarily conserved but only recently discovered biological phenomenon, may be an effective gene manipulation tool to combat viruses. The ability of RNA interference to silence or knockdown specific mRNA through the use of short dsRNA fragments has been an effective tool to study gene function in many systems. In this study, we demonstrated the effectiveness of RNA interference to knockdown the VEE E2 gene expressed in mammalian cells. Here, a DNA-directed approach was used to transfect Vero cells with siRNA expression vectors. We demonstrated that both target siRNAs were effective in significantly reducing the level of E2 expression based on RT-PCR analysis of mRNA levels. Furthermore, the use of these vectors demonstrates the usefulness of a vector-based approach to silencing genes. Future

studies will assess the efficacy of these E2-specific siRNA expression constructs in the inhibition of the VEE virus in vitro.  
DTIC

*Deoxyribonucleic Acid; Encephalitis; Ribonucleic Acids; Viruses*

**20080001505** Defence Research and Development Suffield, Suffield, Alberta Canada

**Generation of Constructs for DNA-Directed RNA Interference of Venezuelan Equine Encephalitis Virus Genes**

Bhogal, H S; Jager, S J; McLaws, L J; Dec 2006; 27 pp.; In English; In English; Original contains color illustrations

Report No.(s): AD-A472790; DRDC-SUFFIELD-TM-2006-237; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Venezuelan equine encephalitis (VEE) virus is an important human and veterinary pathogen with no effective treatment or prophylaxis. One strategy that has shown promise as an anti viral is a mechanism of gene silencing known as RNA interference. Although conventional RNA interference involves the use of dsRNA molecules, here we describe the generation of a panel of DNA cassettes which encode siRNA sequences. Three different VEE virus genes encoding E2 glycoprotein, nucleocapsid, and non-structural protein 4 were selected as candidates for gene silencing. Using a PCR-based approach, we report here on the selection of the VEE targets, construction of these siRNA expression cassettes, and the cloning of these cassettes into siRNA expression plasmids. These DNA plasmids, once transfected into mammalian cells, are able to express putative small interfering RNA molecules targeting specific regions of the VEE viral genome.

DTIC

*Deoxyribonucleic Acid; Encephalitis; Genes; Ribonucleic Acids; Viruses*

**20080001635** Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

**Antisense Treatments for Biothreat Agents**

Warfield, Kelly L; Panchal, Rekha G; Aman, M J; Bavari, Sina; Aug 1, 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473095; TR-06-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473095>

Antisense oligomers (ASOs) represent a promising technology to treat viral and bacterial infections, and have already been shown to be successful against a variety of pathogens in cell culture studies and nonhuman primate models of infection. For these reasons, antisense technologies are being pursued as treatments against biothreat agents such as Ebola virus, dengue virus and Bacillus anthracis. Several generations of modified oligonucleotides have been developed to maximize nuclease resistance, target affinity, potency, cell entry, and other pharmacokinetic properties. First-generation ASOs contain phosphorothioate modifications to increase stability through nuclease resistance. Further chemical modifications in second-generation ASOs include 2'-O-methyl and 2'-O-methoxy-ethyl oligos, which increase nuclease resistance and oligo:RNA binding affinities. Third-generation ASOs contain a variety of chemical modifications that enhance stability, affinity and bioavailability. A fourth class of oligonucleotide-based compounds consists of small interfering RNAs, which have recently become widely used for gene knockdown in vitro and in vivo. This review focuses on the third-generation phosphorodiamidate morpholino oligomers, which are nonionic and contain a morpholine ring instead of a ribose, as well as phosphorodiamidate linkages in place of phosphorothioates. Multiple antisense oligomer-based therapeutics are being developed for use against biothreat agents, and antisense drugs will likely become a critical member of our arsenal in the defense against highly pathogenic, emerging or genetically engineered pathogens.

DTIC

*Bacillus; Infectious Diseases; Microorganisms; Oligomers; Pathogens; Therapy; Viral Diseases*

**20080001647** Army Research Inst. of Environmental Medicine, Natick, MA USA

**What Does Military Biomedical Research Contribute to Sustaining Soldier Performance in Cold Environments?**

Friedl, Karl E; Dec 2005; 25 pp.; In English

Contract(s)/Grant(s): Proj-879

Report No.(s): AD-A473107; USARIEM-TN-T07-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473107>

Research on the physiology of performance limits provides simple and effective solutions involving the way we feed, train, and equip the Soldier. Accurate predictions of human performance offer useful decision aids to military planners, set safe limits in training, and provide a scientific basis to evaluate military strategies or off-the-shelf technologies. Current cold physiology studies focus on hypothermia risk prediction, militarily relevant performance, and affordable metabolic

countermeasures. Joint Norwegian-U.S. research cooperation on extending human limits in cold environments is a logical expansion of previous productive Norwegian Defense Research Establishment (NDRE)-USARIEM studies, with new opportunities and requirements presented by Norwegian leadership in NATO cold weather training.

DTIC

*Biomedical Data; Cold Weather; Hypothermia; Medical Science; Military Personnel; Military Technology; Physiological Effects; Research and Development*

**20080001661** Queensland Univ., Saint Lucia, Australia

**Processing of Visual Information in Mantis Shrimps**

Marshall, Justin; Kleinlogel, Sonja; Jun 5, 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA5209-04-P-0395

Report No.(s): AD-A473131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473131>

Report of a 3 year investigation into the physiological structure of the mantis shrimp eye. This creature has the most advanced and most complex eye of any creature in nature, with many band-pass elements, including those outside of human viewing spectra. It also can see polarized light 'linear and circular, both directions'

DTIC

*Data Processing; Information; Photoreceptors; Visual Perception*

**20080001670** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Feasibility of Developing a Human Simulator for CBRN IPE Testing**

Middleton, Jason K; Richardson, Aaron W; Winkel, David J; Hofacre, Kent C; Aug 2007; 83 pp.; In English

Report No.(s): AD-A473145; ECBC-CR-093; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473145>

The U.S. Army Edgewood Chemical Biological Center (ECBC) evaluates the ability of individual protective equipment (IPE) to mitigate chemical, biological, radiological, and nuclear (CBRN) exposures. In support of this, the Respiratory Protection Team (ECBC) developed and evaluated advanced test systems and methods to better understand respirator performance under operational conditions. The objectives of this effort were to define the requirements for an advanced test manikin for evaluating CBRN respirators and perform a market survey to identify applicable technologies for potential incorporation. The requirements were defined in coordination with the National Institute for Occupational Safety and Health. Features desired included, but were not limited to, a skin-like sealing surface, correct anthropomorphic dimensions, simulation of metabolism (i.e., oxygen consumption/carbon dioxide production), versatility of wave forms for human breathing, generation of heat and perspiration, upper body articulation, movement of face and jaw, simulation of vision, and integrated sample ports. The market survey results were compared with the requirements to assess feasibility and identify the technology gaps. The development of the simulator was divided into three phases, with the Phase I meeting the minimum requirements for fit testing prototyping. A development plan for the Phase I simulator was outlined.

DTIC

*Breathing Apparatus; Masks; Protectors; Radiology; Respiratory System; Simulation; Simulators*

**20080001687** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Demonstration of Real-Time Physiological Status Monitoring of Encapsulated 1st Civil Support Team - Weapons of Mass Destruction (CST-WMD) Personnel**

Buller, Mark J; Tharion, William J; Karis, Anthony J; Santee, William R; Mullen, Stephen P; Blanchard, Laurie A; Hoyt, Reed W; Oct 2007; 63 pp.; In English

Report No.(s): AD-A473188; USARIEM-TR-T08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473188>

Civil Support Teams Weapons of Mass Destruction (CST-WMD) have a requirement for a medical monitoring telemetry system. This study demonstrated the Warfighter Physiological Status Monitoring (WPSM) system's capability in meeting those needs during a typical training exercise. CST-WMD Soldiers (n= 12) volunteered for this study. The Vital Sign Detection System (VSDDS) and hub were worn during 2 days of training. Remote monitoring took place with data transmitted to a base station laptop. Data was obtained every 15s. Mean data loss = 1.1 1.4%; 5% in the worst case. Most data were within physiologically reasonable bounds (98.7%). Respiration rate data was more variable and appeared to be less valid due to a firmware error. The VSDDS met the needs of CST-WMD for missions lasting < 8 hours. Skin irritation could be an issue for

some individuals, especially for longer duration missions (> 8 hours). The graphical user interface (GUI) was adequate for CST-WMD medical monitoring purposes. In summary, currently WPSM system combined with commercial off-the-shelf radios met the CST-WMD medical monitoring needs.

DTIC

*Destruction; Personnel; Physiological Effects; Physiology; Real Time Operation*

**20080001693** Virginia Commonwealth Univ., Richmond, VA USA

**Mechanism of Telomerase Inhibition Using a Small Inhibitory RNAs and Induction of Breast Tumor Cell Sensitization**

Poynter, Kennon R; Holt, Shawn E; Elmore, L W; Apr 2007; 53 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0421

Report No.(s): AD-A473202; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473202>

Telomerase, a ribonucleoprotein enzyme minimally composed of an RNA template (hTR) and a catalytically active protein subunit (hTERT), synthesizes telomeric repeats onto chromosome ends and is obligatory for continuous tumor cell proliferation, as well as malignant progression of breast cancer cells. Telomerase is an attractive anti-cancer therapeutic target because its activity is present in over 90% of human cancers, including more than 95% of breast carcinomas, but undetectable in most somatic cells. Traditional chemo- and radiotherapies lack the ability to effectively control and cure breast cancer, in part because residual cells are or become resistant to DNA damaging modalities. While various telomerase inhibition strategies cause cancer cells to undergo apoptosis or senescence, there is often a lag period between administration and biologic effect (Corey, 2002). Our goal in this study was to compare the efficacy of different telomerase inhibition strategies in concert with standard chemotherapeutic agents at triggering senescence and/or apoptosis in cultures of breast cancer cells. We hypothesized that telomerase inhibition strategies will sensitize breast cancer cells to traditional chemotherapies, potentially reducing the lag phase, allowing for more potent anti-tumor effects at lower doses, and therefore ultimately imparting less toxicity to the patient.

DTIC

*Breast; Cancer; Cells (Biology); Enzymes; Mammary Glands; Ribonucleic Acids; Tumors*

**20080001697** General Accounting Office, Washington, DC USA

**Defense Health Care. DOD Needs to Address the Expected Benefits, Costs, and Risks for Its Newly Approved Medical Command Structure**

Hinton, Jr , Henry L; Stewart, Derek B; Burrell, Sandra B; Beale, Rebecca S; Bolitzer, Benjamin A; Coleman, Grace A; Ditto, Susan C; Fox, Steve J; Matta, Julia C; Mejstrik, Clara C; Oct 2007; 34 pp.; In English

Report No.(s): AD-A473208; GAO-08-122; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473208>

Why GAO Did This Study: The Department of Defense (DOD) operates one of the largest and most complex health systems in the nation and has a dual health care mission -- readiness and benefits. The readiness mission provides medical services and support to the armed forces during military operations. The benefits mission provides health care to over 9 million eligible beneficiaries, including active duty personnel, retirees, and dependents worldwide. Past GAO and other reports have recommended changes to the military health system (MHS) structure. GAO was asked to (1) describe the options for structuring a unified medical command recommended in recent studies by DOD and other organizations and (2) assess the extent to which DOD has identified the potential impact these options would have on the current MHS. GAO analyzed studies and reports prepared by DOD's Joint/Unified Medical Command Working Group, the Defense Business Board, and the Center for Naval Analyses, and interviewed department officials. What GAO Recommends: GAO is recommending that DOD address the expected benefits, costs, and risks for implementing the fourth option and provide Congress the results of its assessment. In commenting on a draft of this report, DOD concurred with GAO's recommendations.

DTIC

*Costs; Defense Program; Health; Management Systems; Medical Services; Risk*

**20080001833** New Jersey Medical School, New Brunswick, NJ USA

**Regulation of Breast Cancer-Induced Angiogenesis by a Growth Arrest-specific Homeobox Transcription Factor**

Gorski, David H; May 2005; 58 pp.; In English

Report No.(s): AD-A473248; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Homeobox genes represent a class of transcription factors important in embryogenesis, organogenesis, cell growth and

differentiation, and cell migration. However, there is little known about their role in regulating endothelial cell (EC) phenotype in response to proangiogenic factors secreted by breast cancer, although at least two homeobox genes (HOXD3 and HOXD10) have been implicated in inducing the angiogenic phenotype in ECs. We are therefore testing the hypothesis that the homeobox gene Gax regulates breast cancer-induced angiogenesis through its ability to regulate the expression of downstream target genes in ECs. Using in vitro tube formation assays, we have found that Gax expression inhibits in vitro angiogenesis. Moreover, by quantitative real time reverse transcriptase real time PCR, we have found that Gax expression is downregulated by proangiogenic factors, while cDNA micorarray analysis demonstrates that Gax downregulates pro-angiogenic adhesion molecules in ECs and upregulates the cyclin-dependent kinase inhibitor p19INK4D. More importantly, Gax expression downregulates NF-B activity in ECs. These observations will allow us to study the mechanism of Gax-mediated activation or repression of their expression to be studied and will form the basis for future studies that will examine in more detail the mechanism by which Gax activates downstream target genes and the detailed signaling pathways involved in this activation. Given the profound effect Gax has on endothelial cell activation, it is likely that these studies will identify new molecular targets for the antiangiogenic therapy of breast cancer. Ultimately, these same techniques will be applied to other homeobox genes implicated in regulating EC phenotype during breast cancer-induced angiogenesis.

DTIC

*Angiogenesis; Breast; Cancer; Genes; Mammary Glands*

**20080001835** Parkinson's Action Network, Washington, DC USA

**The Pan 13th Annual Forum**

Comstock Rick, Amy; Nov 2007; 10 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0003

Report No.(s): AD-A473250; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This conference grant supported the Parkinson's Action Network (PAN)'s 13th Annual Research and Education Forum for Parkinson's patients, their families/caretakers and advocates held February 11 to 13, 2007 at the Washington Plaza Hotel, Washington, DC. This forum brought together some of the foremost doctors and scientists working on Parkinson's research to share their work with patients and leaders in the Parkinson's community. PAN's Research and Education Forum serves as a premier educational program for Parkinson's physicians, patients, researchers as well as leaders in the Parkinson's community. The primary goal of the Forum is to bring together these various stakeholders so that they can share information and learn about the latest developments in Parkinson's research. Through plenary sessions, workshops and networking opportunities, participants will learn about the latest research and discuss creative ideas for new research endeavors. Fundamental to the success of the Forum is the premise that visiting scientists and researchers can learn from each other and from Parkinson's patients and caregivers.

DTIC

*Diseases; Medical Science*

**20080001841** Pennsylvania Univ., Philadelphia, PA USA

**Quality of Life and Cost Effectiveness of Prostate Cancer Treatment**

Jayadevappa, Ravishankar; Mar 2007; 74 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0257

Report No.(s): AD-A473259; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Study objective is to assess the effects of differential treatments for prostate cancer on quality of life and cost of care for two ethnic groups. It will also include comparison of cost effectiveness and HRQoL for men with prostate cancer from two health care systems: Veterans Affairs (VA) and non-VA (UPHS). Specific aims: Controlling for stage at diagnosis and co-morbidity, (1) analyze progression of cancer, HRQoL, incremental cost and satisfaction with care of prostate cancer patients across two ethnic groups, (2) analyze short and long term cost-effectiveness of prostate cancer treatment across ethnic groups; and (3) analyze resource utilization patterns, treatment modalities and quality of life of men with prostate cancer between non-VA and VA hospitals. For this prospective cohort study, we have completed the required recruitment and have established a successful recruitment and retention program. In total, we have recruited 310 patients (<65 ) from the Urology and Radiation Oncology clinics, University of Pennsylvania Health System and VA medical center with a retention rate of more than 85% for our follow-up surveys. Using the study results, we have published four articles. Also, in this grant period we have presented six peer-reviewed abstracts in national and international conferences. We have obtained one year no-cost extension to complete the analysis and modeling.

DTIC

*Cancer; Cost Effectiveness; Life (Durability); Life Cycle Costs; Prostate Gland*

**20080001843** Michigan Univ., Ann Arbor, MI USA

**Chemo Resistance of Breast Cancer Stem Cells**

Wicha, Max S; May 1, 2007; 79 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0471

Report No.(s): AD-A473265; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There is increasing evidence that breast cancers are driven by a small subcomponent that displays stem cell properties. We hypothesize that these breast cancer stem cells are resistant to chemotherapy and may contribute to tumor relapse. In order to provide evidence for this, we determined the effect of chemotherapeutic agents on breast cancer stem cell populations in primary mouse xenografts. Tumor regression induced by these chemotherapeutic agents is accompanied by an enrichment in cancer stem cells as determined by the stem cell marker CD44+ CD24- and Aldehyde dehydrogenase. In order to determine the clinical relevance of these studies, we have examined expression of these markers in patients receiving neoadjuvant therapy utilizing pre- and post-treatment biopsies. In two separate studies, one completed at the University of Michigan and one in collaboration with Baylor College of Medicine, we demonstrate that tumor shrinkage from neoadjuvant chemotherapy is associated with an increase in the percent of stem cells in residual tumors. These studies provide support for the cancer stem cell hypothesis and suggest that more effective therapies against breast cancer will require the development of strategies to target and eliminate the cancer stem cell population.

DTIC

*Breast; Cancer; Chemotherapy; Drugs; Mammary Glands; Stem Cells*

**20080001845** Naval Medical Research Center, Silver Spring, MD USA

**Campylobacter jejuni Induces Secretion of Proinflammatory Chemokines from Human Intestinal Epithelial Cells**

Hu, Lan; Hickey, Thomas E; Feb 2, 2005; 5 pp.; In English

Report No.(s): AD-A473268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Campylobacter jejuni is a common cause of diarrhea in humans. While the pathogenic mechanisms of C. jejuni are not completely understood, host inflammatory responses are thought to be contributing factors. In this report, C. jejuni 81-176 is shown to up-regulate chemokines essential to inflammatory responses. Growth-related oncogene alpha (GRO alpha), GRO gamma, macrophage inflammatory protein 1, monocyte chemoattractant protein 1 (MCP-1), and gamma interferon-inducible protein 10 (gamma IP-10) mRNA transcription in INT-407 cells was enhanced within 4 h of bacterial exposure. Infection with viable campylobacters was necessary for sustained chemokine transcription and was NF-kappa B dependent. GRO alpha, gamma IP-10, and MCP-1 chemokine secretions were confirmed by immunological assays.

DTIC

*Intestines; Secretions*

**20080001846** Alabama Univ., Birmingham, AL USA

**A Dual-Action Armed Replicating Adenovirus for the Treatment of Osteoblastic Bone Metastases of Prostate Cancer**

Douglas, Joanne T; Mar 2007; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0800

Report No.(s): AD-A473269; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We hypothesize that the efficacy of a replicating adenovirus for the treatment of bone metastases of prostate cancer could be enhanced by arming it with the therapeutic protein sOPG-Fc which will block osteoclastic bone resorption and hence inhibit bone remodeling. Thus we constructed a dual-action armed replicating adenovirus expressing sOPG-Fc designed to both directly kill metastatic prostate cancer cells by oncolysis and also secrete sOPG-Fc into the microenvironment of the bone thereby inhibiting osteoclastic bone resorption. We have shown that the sOPG-Fc gene is expressed in a similar temporal manner to the E3B genes which it replaced and that the remaining E3 genes continue to be expressed. We have confirmed that expression of sOPG-Fc does not impair the selectivity or oncolytic potency of the armed replication-selective adenovirus. We have confirmed that the armed replicating adenovirus can simultaneously eradicate prostate cancer cells by oncolysis and inhibit osteoclast formation in vitro.

DTIC

*Adenoviruses; Bones; Cancer; Metastasis; Prostate Gland*

**20080001858** Congressional Budget Office, Washington, DC USA

**Projecting the Costs to Care for Veterans of U.S. Military Operations in Iraq and Afghanistan**

Goldberg, Matthew S; Oct 17, 2007; 21 pp.; In English

Report No.(s): AD-A473294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This testimony focuses on the numbers of troops who have served in those operations and the numbers who have



sustained injuries and provide some indication of the severity of those injuries. It addresses the extent to which veterans of those operations have sought medical care from the Department of Veterans Affairs (VA) and the types of care they have received. Finally it discusses the Congressional Budget Office's (CBO's) projections of the resources that VA may require over the next 10 years not only to continue providing that medical care, but also to provide associated benefits such as disability compensation paid to veterans with service-connected disabilities and dependency and indemnity compensation (DIC) paid to survivors of service members.

DTIC

*Afghanistan; Cost Estimates; Costs; Iraq; Medical Services*

**20080001907** North Shore Univ. Hospital, Manhasset, NY USA

**Role of Rac GTPases in Chemokine-Stimulated Breast Carcinoma Metastasis**

Symons, Marc; Jul 2007; 15 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0323

Report No.(s): AD-A473355; No Copyright; Avail.: Defense Technical Information Center (DTIC)

CXCR4 is highly expressed in breast carcinoma cells and is essential for breast cancer metastasis to the lung. CXCR4 is the receptor for CXCL12 a chemokine that is enriched in organs that are targeted by metastatic breast cancer such as lung and liver. The molecular mechanisms of CXCR4-mediated breast cancer metastasis however are poorly understood. In this project we test the hypothesis that Rac proteins are essential for CXCR4-mediated breast carcinoma cell proliferation and survival thereby contributing to breast cancer metastasis. The Rac proteins examined comprise Rac1 Rac1b and Rac3. In Task 1 we investigate the role of Rac proteins in CXCL12-regulated breast carcinoma cell proliferation and survival in vitro. In Task 2 we will determine the contribution of these Rac proteins to breast cancer metastasis in vivo. These approaches should allow us to validate Rac-controlled signaling proteins as novel therapeutic targets for metastatic breast cancer. The research performed in the first two years of funding has largely consisted of scaling technical obstacles. However we have now identified a CXCL12-responsive metastatic breast carcinoma cell line and have obtained results indicating that Rac1 and Rac1b play distinct roles in cell proliferation and cellular signaling events.

DTIC

*Breast; Cancer; Liver; Lungs; Mammary Glands; Metastasis*

**20080001910** Indiana Univ., Bloomington, IN USA

**Development of a Gene Therapy Trial for Metastatic Prostate Cancer**

Gardner, Thomas A; Jul 2006; 24 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0479

Report No.(s): AD-A473358; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This award was to support the infrastructure and development of a Phase I clinical trial for men with metastatic prostate cancer. The Phase I trial under development employs a prostate restricted replicative adenovirus (PRRA) with excellent preclinical performance in vitro and in vivo in relevant animal models of human prostate cancer. Several components of the statement of work for this award have been completed. The key component of this trial the PRRA AdIU1 required a slight modification before proceeding with implementation of the trial as submitted. Reconfirmation of the activity of the modified AdIU1 was required prior to moving forward with the clinical trial. A majority of the funding from this award remains in the CTDA account and a no cost extension has been requested to allow continued development of the trial in order to apply for a 2007 DOD Clinical Trial Award to initiate a trial in 2008. Currently with the clinical trial team in place and modified AdIU1 verified the regulatory applications on hold can be filed.

DTIC

*Adenoviruses; Cancer; Gene Therapy; Metastasis; Prostate Gland*

**20080001914** University of Southern California, Los Angeles, CA USA

**Chemoprevention of Breast Cancer by Mimicking the Protective Effect of Early First Birth**

Pike, Malcolm C; Jun 2007; 37 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0390

Report No.(s): AD-A473365; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have successfully shown that in the rat estradiol, estradiol plus progesterone, and beta-HCG is protective against carcinogen-induced mammary tumorigenesis. Progesterone alone was not protective. Also, treatment with perphenazine was partially protective. We have continued to collect normal breast tissue from women undergoing elective reduction

mammoplasty. Estrogen receptor and progesterone receptor have been characterized as well as cell proliferation have been characterized in these samples. Two chemoprevention protocols have been developed and are set to begin recruitment in the near future. The first will evaluate the role of high dose progestins on cell proliferation and gene expression profiles in the breast. The second protocol will evaluate the role of various oral contraceptive progestin doses on cell proliferation and gene expression profiles in the breast.

DTIC

*Birth; Breast; Cancer; Mammary Glands*

**20080001918** Mayo Clinic, Rochester, MN USA

**Benign Breast Disease: Toward Molecular Prediction of Breast Cancer Risk**

Hartmann, Lynn C; Jun 2007; 33 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0473

Report No.(s): AD-A473371; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Optimal early detection and prevention strategies for breast cancer are predicated on our ability to identify individuals at significantly increased risk for this disease. The purpose of this Center is to bring molecular risk prediction for breast cancer into the clinical area. This will require progress on three fronts of scientific endeavor: (i) Establishment of a tissue repository of benign breast disease; (ii) Assessment of potential biomarkers of risk in this tissue set and (iii) Discovery of new, potentially relevant biomarkers of risk. We have made significant progress on these aims. Our current cohort comprises 9,376 women, 758 (8%) of whom have been diagnosed with breast cancer since the time of their benign biopsy. We established our tissue repository of benign breast tissue and have collected the subsequent breast cancer tissue. We assessed the significance of benign histology in predicting risk of future breast cancer, examining in detail the role of proliferative disease, atypia, papillomas, radial scars and involution. We explored the link between centrosome amplification, COX-2 expression and breast cancer outcomes and are currently exploring the significance of p16, ER and MIB-1. We have begun our work with Wayne State to characterize the histopathology in a cohort of African American women. Our focus in 2007-2008 will be on the Wayne State cohort and exploring additional molecular markers.

DTIC

*Breast; Cancer; Mammary Glands; Risk*

**20080001919** Louisville Univ., KY USA

**A Novel Approach for the Identification of Pharmacophores through Differential Toxicity Analysis of Estrogen Receptor Positive and Negative Cell Lines**

Cunningham, Albert R; Day, Billy W; Jul 2007; 5 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0236

Report No.(s): AD-A473372; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This grant was award to the PI at Louisiana State University. He left there in August 2006 and with the assistance of Grant Manager Dr. Carole Christian it was transferred to the University of Louisville where he started April 2007. Minimal work was done on the project prior to departure from LSU and minimal funds were expended. This project was essential to my obtaining an appointment as an Associate Professor of Medicine at the University of Louisville's James Graham Brown Cancer Center along with significant startup package and my involvement as a Project PI on the Brown Cancer Centers NIH-funded Molecular Targets Program. Currently my new laboratory has been equipped with the needed computer hardware and software. I anticipate the postdoctoral fellow hired to participate on the project will start by August 6, 2007 and given the revised timeline for this project. I expect that it will be completed on time and as planned.

DTIC

*Breast; Cancer; Drugs; Estrogens; Mammary Glands; Toxicity*

**20080001922** McMaster Univ., Hamilton, Ontario Canada

**Enhancing Involvement in Treatment Decision Making by Women with Breast Cancer**

O'Brien, Mary A; Whelan, Timothy; Gafni, Amiram; Charles, Cathy; Ellis, Peter; Jul 2007; 34 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0329

Report No.(s): AD-A473376; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Women with breast cancer desire more information about their disease, in part, to be involved in making treatment decisions (TDs). Patient involvement responds to patients' desires for autonomy and addresses ethical concerns about rights to make TOs. However, several researchers have reported that patients' actual experiences in TDM did not match their

preferences. The study objectives are to 1) understand the meaning of involvement in TOM from the perspectives of women with early stage breast cancer (ESBC); 2) identify stages/steps of TDM used by women and their physicians during the treatment consultation(s); and 3) identify the behaviors of women and physicians that facilitate or impede women's involvement in TDM. A qualitative approach with interviews and video-stimulated recall is being used. In Phase 1, interviews with 19 women with ESBC were held to understand the concept of involvement in TOM. In Phase 2, surgical (n=6) or medical oncology (MO) consultations (n=15) with new ESBC patients were videotaped. Subsequently, women and medical oncologists or surgeons separately viewed their consultation. Interviews were taped, transcribed, and analyzed. Phase 1: Most women wanted high quality information soon after diagnosis but many felt isolated and uninformed until the surgical or the medical oncology visit. In Phase 2, most women described an iterative TOM process where they made a preliminary treatment decision prior to the consultation, often based upon experiences of family or friends. Clinicians described many behaviors used to facilitate the patient's involvement in TOM. While women reported some of these behaviors, they also reported fewer or different behaviors than clinicians. Significance: The information from this study will be useful to patients and physicians for promoting patient involvement. It can be used to develop and evaluate training programs for both physicians and patients to involve patients with cancer in decisions about their care.

DTIC

*Breast; Cancer; Decision Making; Females; Mammary Glands*

**20080001923** Childrens Research Inst., Columbus, OH USA

**The Role of Drosophila Merlin in the Control of Mitosis Exit and Development**

Chang, Long-Sheng; Jul 2007; 153 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0509

Report No.(s): AD-A473377; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To better understand the mechanism by which Merlin functions as a tumor suppressor we have shown that mutations in the Drosophila Merlin gene lead to increased mitosis and alter the duration of the G2 phase of the cell cycle. We have also found that the Merlin protein is dynamically redistributed during meiosis and discovered for the first time Merlin immunoreactivity in the mitochondria. In support of the finding of a genetic interaction between Merlin and lap which encodes an adapter protein involved in vesicular trafficking we show that both the Merlin and Lap proteins colocalize at the cellular cortex of the wing imaginal disc cell. In addition we demonstrate that the distribution of the Merlin protein in the wing imaginal disc is not affected by other tumor suppressor mutations. We also show that the Drosophila Merlin protein is regulated by phosphorylation; while the non-phospho-Merlin protein appears mostly in the cytoplasm the phospho-Merlin protein can be seen in the membrane region. Furthermore we have found that the AKT pathway is frequently activated in NF2-tumor cells. We have tested two novel compounds OSU03012 and (S)-HDAC-42, which inhibit AKT phosphorylation. We show that these drugs effectively inhibit the growth of vestibular schwannoma cells. These findings set the stage for a phase 1 clinical trial on VS in the future.

DTIC

*Drosophila; Genes; Genetics; Mitosis*

**20080001926** Whitehead Inst. for Biomedical Research, Cambridge, MA USA

**Identifying Novel Drug Targets for the Treatment of Tuberous Sclerosis Complex Using High Throughput Technologies. Addendum**

Sabatini, David; Jul 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0138

Report No.(s): AD-A473385; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In a patient with Tuberous Sclerosis Complex (TSC), the problematic cells that initiate and constitute tumors have lost TSC1 or TSC2 function. A promising approach for treatment would be to target members of the pathway with which TSC1/2 proteins interact. In cultured drosophila cells, we proposed to rapidly identify genes whose RNAa-mediated reduction in expression (1) Prevents growth proliferation of TSC1 or TSC2 deficient cells without affecting normal cells. (2) induces apoptosis/cell death in TSC1 or TSC2-deficient cells without killing normal cells. (3) Reverts TSC1 or TSC2-deficient cells to a normal phenotype, as determine by measuring a reporters of cell growth pathway activation and cell morphology. We have (1) advanced genome-wide RNA interference living cell microarrays from proof-of-principle to a robust technology. (2) developed software to analyse these screens, a previously formidable challenge, and (3) completer genome-wide experiments to identify genes involved in the TSC pathway.

DTIC

*Chemotherapy; Identifying; Morphology; Targets*

**20080001927** Duke Univ., Durham, NC USA

**Killing Breast Cancer Cells through Activation of the Apoptosome**

Kornbluth, Sally; Jun 2007; 6 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0496

Report No.(s): AD-A473389; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to a variety of different stressors, cells initiate a death program that is carried out by a family of cysteine proteases known as caspases. Caspase activation in response to chemotherapeutics typically proceeds through pathways that induce transit of cytochrome c from the intermembrane space of the mitochondria to the cytoplasm. Engagement of a cytosolic protein, Apaf-1, by cytochrome c nucleates the formation of a structure known as the apoptosome, in which caspase 9 is activated by Apaf-1/cytochrome c. For many tumor types (eg. ovarian, leukemias, prostate cancers), chemotherapy fails either because the agents employed fail to trigger the release of mitochondrial cytochrome c or because the apoptosome is in some way defective and so cannot respond to cytochrome c. However, in analyzing a large battery of breast cancer cell lines, we made the surprising discovery that they were exquisitely sensitive to cytochrome c, dying much more rapidly than normal breast cells in response to even low levels of cytoplasmic cytochrome c. Why then are breast cancers not rapidly and uniformly killed by chemotherapeutics? Our initial analysis indicates that breast cancer cells are highly variable in their ability to release cytochrome c following treatment with chemotherapeutic agents, despite their uniform susceptibility to cytochrome c once it has appeared in the cytoplasm. These findings suggest that treatments able to bypass the mitochondria and activate the apoptosome directly (ie. mimic mitochondrially-released cytochrome c) might be more effective than conventional therapeutics in inducing the death of breast cancer cells. This report documents our initial attempts to access this pathway therapeutically.

DTIC

*Breast; Cancer; Cysteine; Mammary Glands; Proteins*

**20080001929** Rice Univ., Houston, TX USA

**Seamless Integration of Detection and Therapy for Breast Cancer using Targeted Engineered Nanoparticles**

Halas, Naomi J; Jun 2007; 72 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0384

Report No.(s): AD-A473391; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report summarizes the efforts of our team consisting of researchers from Rice University and M. D. Anderson Cancer Center, in the DoD funded CDMRP award towards the development of an integrated nano particle based imaging and therapy of breast cancer. We have made significant progress in our goals to demonstrate enhanced contrast in Optical Coherence Tomography (OCT) imaging tumors and photo thermal ablation using a single multifunctional particle. We have optimized the nanoshell that has a resonance in the near IR physiological water window, and can be used for both optical diagnostic imaging and photo thermal therapy. We have also explored other optical techniques for diagnosing malignant tumors from normal tissue.

DTIC

*Breast; Cancer; Imaging Techniques; Mammary Glands; Nanoparticles; Therapy*

**20080001931** Michigan Univ., Ann Arbor, MI USA

**Detection of Metastatic Potential in Breast Cancer by RhoC-GTPase and WISP3 Proteins**

Kleer, Celina G; May 2007; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0490

Report No.(s): AD-A473395; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Breast cancer is the most common type of life-threatening cancer, and the second most common cause of cancer related deaths of women in the USA. Even though the larger the primary tumor, the greater the likelihood of metastases, this is not always the case. There are many small breast cancers with a highly aggressive and metastatic behavior and discouraging outcome that remain under treated because there is no marker capable of identifying them. In this proposal we will study the utility of detecting RhoC GTPase and WISP3 proteins by immunohistochemistry as biological prognostic markers capable of identifying breast cancers with high propensity to metastasize, independently of tumor size. The impact of this study is that we will develop a clinically useful test to detect which invasive cancers will metastasize, and that will allow clinicians to institute early treatment before the development of metastases. This will impact on patient outcome. We will also study the predictive power of RhoC GTPase and WISP3 expression in the response of breast cancer to farnesyl transferase inhibitors, a new gene-targeted treatment modality for advanced cancers.

DTIC

*Breast; Cancer; Mammary Glands; Metastasis; Proteins*

**20080001932** Rochester Univ., NY USA

**Angiogenic Signaling in Living Breast Tumor Models**

Brown, Edward; Jun 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0396

Report No.(s): AD-A473397; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this grant we propose to elucidate the signaling pathway that translates VEGFR activation into elevated vessel permeability, in endothelial cells within living breast tumor models. The working hypothesis is that the signaling pathway involved is a constitutively active form of the pathway shown for healthy mesenteric microvessels. Progress to date includes the training of personnel in the laboratory, the completion of instrumentation development for a novel method for the measurement of convective flow in tumors in vivo and extensive analysis of its capabilities, extensive investigation of breast tumor extracellular matrix using second harmonic generation, extensive analysis of the abilities of a novel permeability measurement technique and numerous preliminary experiments to establish methodology for tasks to commence in upcoming years.

DTIC

*Angiogenesis; Breast; Endothelium; In Vivo Methods and Tests; Tumors*

**20080001940** Utah Univ., Salt Lake City, UT USA

**Using Genetically Engineered Mice to Probe the Role of Bioactive Lipids in Prostate Carcinogenesis**

Stafforini, Diana M; Jul 2007; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0135

Report No.(s): AD-A473423; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer (CaP) is the second most common cause of cancer death in North American men. CaP is characterized by stages that include aggressive forms that disseminate to other tissues. Tumors release factors that attract and activate cells of the immune system including macrophages. Exposure of macrophages to inflammatory stimuli results in the transcriptional activation of an anti-inflammatory phospholipase A2, platelet-activating factor acetylhydrolase (PAF-AH) that inactivates PAF and other bioactive phospholipids. PAF-AH expression is dramatically increased in CaP compared to normal prostate tissues. During the tenure of this Award we used in vivo and in vitro methodologies to investigate whether PAF and PAF-AH participate in the pathogenesis of CaP. We generated PAF-AH-deficient mice in a model of PCa (the TRAMP model) that recapitulates many aspects of human CaP. We established that deficiency of PAF-AH in mice decreases survival and increases disease severity. Secondly, we established that CaP cells respond to stimulation with PAF by increasing calcium transients, activating MAP kinases, and increasing cellular proliferation. These results identified a key role for PAF and PAF-AH in the pathogenesis of CaP and provide us with a framework on which we will build the next research phase which includes targeting this pathway to develop novel strategies to treat human CaP.

DTIC

*Cancer; Carcinogens; In Vitro Methods and Tests; In Vivo Methods and Tests; Lipids; Mice; Prostate Gland*

**20080001942** Cleveland Clinic Foundation, Cleveland, OH USA

**Targeting Androgen Receptor Function by MicroRNA in Prostate Cancer**

Shula, Girish C; Jul 2007; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0191

Report No.(s): AD-A473425; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer is the most commonly diagnosed and second most deadly cancer in North American men and the blockade of androgen action through the AR has been the cornerstone of systemic therapy of prostate cancer. However, the effectiveness of this therapy is rather transient which inevitably fails and tumor growth resumes despite androgen blockade. The failure of AR receptor antagonists results in higher levels of AR protein which promotes the development of androgen-independent prostate cancer. Originally we proposed the utilization of micro (mi) RNAs to blockade the expression of AR in prostate carcinoma cells. We have identified a few miRNAs that can repress the AR protein synthesis in prostate carcinoma cells. Our long-term goals are to identify naturally occurring miRNAs that have potential to block the activity of AR and to improve their efficacy by rational designing to provide novel AR Antagonist miRNAs .

DTIC

*Cancer; Hormones; Males; Prostate Gland*

**20080001951** RAND Corp., Santa Monica, CA USA

**Health Coverage Options for Military Retirees**

Mariano, Louis; Kirby, Sheila; Eibner, Christine; Naftel, Scott; Jan 2007; 4 pp.; In English

Report No.(s): AD-A473454; RAND/RB-9236-OSD; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research brief summarizes the results of a 2006 pilot survey of military retirees, providing information on retirees' enrollment in civilian health care plans and reliance on TRICARE, the Department of Defense-sponsored health insurance.

DTIC

*Health; Medical Services; Military Personnel*

**20080001956** Naval Postgraduate School, Monterey, CA USA

**Manpower Staffing, Emergency Department Access and Consequences on Patient Outcomes**

Meng, Alvin T; Jun 2007; 79 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473463; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Pressure on emergency medical services (EMS) is rising. The growth in EMS utilization has coincided with a decline in the number of emergency departments (ED). Between 1994 and 2004, the annual number of ED visits in the USA rose by 18 percent (from 93 million to 110 million) whereas the number of hospitals operating 24-hour EDs decreased by 12 percent during the same time frame. This study has three objectives: (1) analysis of diversion trends, (2) effect of ED staffing, capacity and financial characteristics on ED diversion hours and (3) effect of changes in ED access on mortality rates. For the first objective, we employ descriptive statistics to study ED diversion trends. For the second analysis, we use a two-part model to study the effect of hospital staffing, capacity and financial characteristics on diversion hours. For the third objective, we use simple ordinary least squares and fixed effects techniques to determine the effect of ED access on mortality rates. In particular, we examine two measures of ED access: diversion hours (a temporary change in ED access) and distance to closest ED (a permanent change in ED access). We find statewide ED diversion impact of California in 2005 to be 11 percent. This means hospital EDs in California in 2005 were on diversion status 11 percent of the time. Reducing the number of nurses increases the number of hours an ED is on diversion status. Interestingly, increasing the number of intern or student doctors in a hospital increases the number of hours an ED is on diversion status. For heart-related and cancer-related deaths, we find a positive correlation between distance and mortality rates. However, for diversion hours, we find it counterintuitive that increasing diversion hours reduces mortality rates. Further study will need to be done to verify this finding.

DTIC

*Ambulances; Emergencies; Hospitals; Manpower; Mortality; Patients*

**20080002116** Defence Research and Development Suffield, Suffield, Alberta Canada

**Toxin Inhibition - Deconvolution Strategies and Assay Screening of Combinatorial Peptide Libraries**

Lee, W E; Chan, N W; Marenco, A J; Moore, G J; Moore, D; Hayden, Lawrence J; Laing, T D; Gregory, M; Mah, D C; Hamilton, M G; Aug 2007; 50 pp.; In English

Report No.(s): AD-A473466; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Combinatorial peptide libraries offer an expedient source of structurally diverse molecules that could serve as lead compounds in the development of drug therapies to toxins. The libraries have typical structures of X1 - X2 - hinge - X3 - X4, where X1 through X4 are near-equimolar mixtures of twelve alpha-L-amino acids and hinge = gamma-aminobutyric acid. Screening of the libraries for inhibitory activity in assays for botulinum neurotoxins A and B (BoNTIA, BoNTIB) and saxitoxin uncovered potent library subsets. For effective screening of the peptide libraries, improved methods of analysis were sought. We report on development of a capillary electrophoresis laser-induced fluorescence (CE LIF) method for measuring BoNTIA peptidase activity and for screening peptide libraries for inhibitory effects. A second analytical method for quantitation of BoNTIA assays was employed based on fluorescence resonance energy transfer (FRET). The FRET assay is homogeneous phase, i.e., no separation step is required. Thus assay time was reduced and throughput increased. The research described in this report was supported by the Technology Investment Fund of Defence R&D Canada.

DTIC

*Assaying; Combinatorial Analysis; Libraries; Peptides; Toxins and Antitoxins*

**20080002126** Massachusetts General Hospital, Charlestown, MA, USA

**Molecular Identification of the Schwannomatosis Locus**

MacCollin, Mia; Jul 2007; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0445

Report No.(s): AD-A473383; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Schwannomatosis is a recently recognized third major type of neurofibromatosis. Our preliminary studies of the NF2 gene

in tumors from schwannomatosis patients reveal a pattern of tumor suppressor gene inactivation not previously reported in any other human disease. Objective/Hypothesis: The objective of this project is to clone the locus responsible for familial schwannomatosis. We are exploring two competing hypotheses which address both the non random distribution of LOH observed in schwannomatosis tumors and the high rate of somatic NF2 mutation seen along the cis allele. Specific Aims: 1. To identify and clinically characterize schwannomatosis patients and maintain a resource of tumor and blood specimens. 2. To further refine the candidate region on chromosome 22 using linkage and loss of heterozygosity analyses. 3. To determine the molecular mechanism of tumor formation in these patients using complementary molecular and cytogenetic approaches. Study Design: Schwannomatosis patients and affected relatives will be identified. Blood and tumor specimens will be obtained for linkage LOH FISH and mutational analysis of coding and non coding candidate regions. Relevance: This study will elucidate the unique pathogenesis of schwannomatosis and provide a means for definitive diagnosis using molecular technology.

DTIC

*Loci; Molecules; Mutations*

**20080002375** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Construction and Analysis of a MutL Knockout Strain of *Vibrio cholerae***

Buckley, Patricia E; Valdes, James J; O'Connell, Kevin P; Oct 2007; 20 pp.; In English

Report No.(s): AD-A473545; ECBC-TR-563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473545>

Most bacterial species contain a DNA mismatch repair system. In *E. coli*, the products of mutS, mutL, and mutH, among others, reduce the rate at which mismatch mutations occur, as well as reduce the incorporation of foreign DNA into the *E. coli* genome (Townsend, 2003). The absence or disruption of these genes increases the background mutation rate (Taddel, 1997). In this study, we describe the construction of a mutL deletion mutant of *Vibrio cholerae*. This knockout strain will be used to determine the contribution of methyl-directed DNA mismatch repair in conferring antibiotic resistance in *V. cholerae*. If the knockout of mutL produces a hypervariable strain of *V. cholerae*, the strain may also be useful in conducting directed evolution experiments at an accelerated pace. The population of *V. cholerae* mutants obtained in such studies may change the way targets for detection, identification, or even vaccines are chosen.

DTIC

*Bacteria; Construction*

**20080002376** Darnall Army Hospital, Fort Hood, TX USA

**Effects of Deployment on the Mental Health of Service Members at Fort Hood**

Dickinson, Carla M; Jul 6, 2006; 87 pp.; In English

Report No.(s): AD-A473546; AMDCS-15-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473546>

A factor in the Army's ability to perform its mission is the continuous supply of forces ready for deployment. The impact deployment has on the mental health of service members affects the policy and the resources needed for mental and behavioral health. The need exists for establishing a baseline to help implement appropriate policy, to improve treatment, and to quantify the resources needed for mental health. The objective of this research is to determine if a significant correlation exists between deployment and the outcome of a provider assessment for mental health. Data collected from the Post-Deployment Health Reassessment (DD Form 2900) were used to compare three deployment groups: never deployed (n= 167), deployed once (n= 1498), and deployed more than once (n=566). Comparisons were made with regard to the mental health screening dimensions of relationship problem, PTSD, alcohol problem, depression, anger problem, and suicidal ideation. Statistical analysis confirms that a significant difference exists for relationship problem  $F(2, 2228) = 3.79, p = .02$  and PTSD  $F(2, 2228) = 3.65, p = .03$ .

DTIC

*Deployment; Diseases; Health; Injuries; Medical Services; Mental Health; Military Operations; Military Personnel; Signs and Symptoms*

**20080002377** Army Medical Dept. Center and School, Fort Sam Houston, TX USA

**Patient Safety Concerns as a Result of Nursing Shortage Trends**

Lee, John W; Jul 10, 2006; 74 pp.; In English

Report No.(s): AD-A473547; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473547>

This study examined the effect of the loss of deployed nurses on the Medical Treatment Facility (MTF) to patient safety.

The period between the deployed nurses' departure and the contract nurse being fully operational appears very crucial. The methods used in this study were the use of the learning curve model and the correlation of deployed nurses and the number of near misses that a back fill nurse may experience. The problem surfaces during the time it takes back fill nurse contractors to get acclimated to the military medical facility. Statistical analysis indicates there is a significant correlation between the number of near misses and deployments of nurses. However, there was no correlation between average length of stay and deployments. The results indicate that mistakes or near misses are more likely to occur during the initial learning curve phase for the back filling nurses.

DTIC

*Deployment; Health; Medical Personnel; Patients; Safety; Trends*

**20080002378** Reynolds Army Community Hospital, Fort Still, OK USA

**Running Head: Improving Pharmacy Customer Satisfaction**

Davis, Kathryn M; Jun 29, 2006; 56 pp.; In English

Report No.(s): AD-A473548; AMEDCS-24-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473548>

The primary objective of this study was to determine in Reynolds Army Community Hospital (RACH) patients are experiencing dissatisfaction with their overall pharmacy experience, as indicated in the DoD Provider Level Patient Satisfaction Survey (PLPSS). A locally developed marketing assessment questionnaire with 37 questions consisting of patient satisfaction dimensions, demographics and utilization questions was used to collect information. The study showed RACH beneficiaries are satisfied with their overall pharmacy experience, accepting the alternate hypothesis: the DoD PLPSS result for overall satisfaction with pharmacy services is not reflective of all the beneficiary categories of the RACH patient population. The highest frequencies of excellent responses were: friendliness and courtesy shown to you (37.6%); quality of treatment you received (34.7%); and answers to questions concerning medications (34.7%). Beneficiary category was a contributing factor to satisfaction with overall quality of care and service ( $X^2=87.404$ ;  $df=5$ ;  $p<.0001$ ) with 33% of active duty beneficiary responses as 'very good' or 'excellent.'

DTIC

*Health; Hospitals; Pharmacology*

**20080002380** Army Medical Center, Fort Gordon, GA USA

**Effects of Using Licensed Practical Nurses to Assist with Telephone Consultation Management**

Wiley, Jennifer L; May 23, 2006; 58 pp.; In English

Report No.(s): AD-A473550; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473550>

The purpose of this project was to examine the effects of using Licensed Practical Nurses to assist providers with telephone consults at one of Dwight David Eisenhower Army Medical Center's primary care clinics. The study compared means of pre- and post-implementation provider overall job satisfaction, provider satisfaction with the telephone consult process, average daily hours providers spent on telephone consults, and the length of time to complete patient generated telephone consults. Average completion time of consults was the only statistically significant dependent variable as shown by  $t(167.84) = 3.68, p <.01$  (two-tailed),  $\gamma = .27$ . Overall, the study provides justification for cautiously pursuing nursing assistance with telephone consultation management despite this study's weakness with provider sample size.

DTIC

*Medical Personnel; Telephones*

**20080002381** Womack Army Medical Center, Fort Bragg, NC USA

**Strategic Plan: Initiating an Orthopaedic Residency at Womack Army Medical Center**

Mangelsdorff, David; Harrington, Jason W; Jun 7, 2006; 49 pp.; In English

Report No.(s): AD-A473551; AMDCS-2-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473551>

This Graduate Management Project delineates strategic planning necessary to implement an orthopaedic residency at Womack Army Medical Center (WAMC). Ginter, Swaney, and Duncan's strategic planning process as outlined in 'Strategic Management of Healthcare Organizations' (2002) provides an ideal framework to address functional team responsibilities and areas in need of further analysis. Currently, strategic direction toward implementing an orthopaedic residency at WAMC does not exist. This projects' utility centers on insight gained through the strategic planning process. Applicable measures to



outlining WAMC's strategy include: stakeholders analysis; analysis of Porter's Five Forces Model; a Strategic Map for discovering competitive advantages and disadvantages; identifying a directional strategy to include analyzing WAMC's mission, vision, and values; unit action planning; controlling strategy through performance evaluation. A directional strategy is identified recognizing the strategic goal of implementing an orthopaedics residency at WAMC. Economic and functional analysis reveals this goal is unrealistic currently.

DTIC

*Initiation; Medical Services; Military Operations; Orthopedics; Performance Tests*

**20080002382** Naval Medical Research Inst., San Diego, CA USA

**Navy Health Care Executive Competencies**

Marty, Stephen A; Apr 4, 2006; 72 pp.; In English

Report No.(s): AD-A473552; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473552>

The purpose of this paper is to update the core competencies and associated skills, knowledge, and abilities (SKAs) required by Navy health care executives. Three waves of the Delphi technique were employed. In Wave I, senior Navy health care executives identified the five most important competencies and their associated SKAs believed to be required for Navy health care executives over the next decade. An expert panel of senior health care executives reviewed and sorted the identified competencies from Wave I into six domain categories and gave each domain an appropriate title. From the expert analysis, the researcher developed a questionnaire for use in Delphi waves II and III. In Wave II, senior executives from Wave I rated the competencies from each domain. During Wave III, junior Navy health care executives completed the same questionnaire given to the senior executives. Results indicated that competencies surrounding interpersonal skills and understanding the environment emerged as most critical for Navy health care executives into the next decade. In addition, statistically significant differences in opinions emerged between groups and among 20 of the 100 individual SKAs rated indicating that senior and junior health care executives have very real differences in opinion regarding required executive skills.

DTIC

*Health; Navy; Personnel*

**20080002383** Blanchfield Army Community Hospital, Fort Campbell, KY USA

**Improving Productivity Through Physician Profiling**

West, Gordon F; Jan 9, 2006; 57 pp.; In English

Report No.(s): AD-A473553; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473553>

Provider profiling is a tool used within healthcare management to determine differences between individual provider productivity levels. This study will attempt to identify some of the variables that influence provider productivity. Specifically, within Blanchfield Army Community Hospital, historical data will be used to determine what group of providers demonstrates the highest level of productivity. Productivity was operationally defined as total simple relative value units (RVUs). These totals represent monthly workload level by provider in each clinical area. The study used multiple linear regression analyses to examine the relationships among variables. Study findings supported the hypothesis that contract medical doctors generate the highest overall productivity. The statistical model yielded  $R^2 = .091$  with  $F(14, 3404) = 24.38$ ,  $p < .001$ . Other variables that emerged with statistical significance were gender, age, location, and board certification. Employment status emerged as the premier variable accounting for nearly 50% of the unique variance explained by this model.

DTIC

*Management Systems; Medical Services; Physicians; Productivity*

**20080002384** Naval Hospital, Charleston, SC USA

**Demand Analysis for Proposed Medical Services at the Future Naval Health Clinic Charleston, South Carolina: A Graduate Management Project**

Barnes, Timothy D; Apr 26, 2006; 50 pp.; In English

Report No.(s): AD-A473554; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473554>

The purpose of this study is to determine the scope of medical services that should be provided to enrolled beneficiaries at the future Naval Health Clinic Charleston based on projected demand and demographics of the population. Twelve months of historical relative value unit (RVU) workload data were used to conduct forecasts to project the future demand for health

care services in 10 specialty practices. Two independent predictive models were created using time-series analysis and utilization rates from the population of interest. Projections were evaluated against Navy Medicine annual benchmark standards for clinical practices to determine if sufficient demand existed to provide each service. Both independent methodologies indicated the need for 5 of the 10 specialty practices evaluated in the study. Results of this study suggest the demographic make-up of the targeted population likely limits the need for certain specialty services that typically serve an older population.

DTIC

*Health; Medical Services*

**20080002386** Tripler Army Medical Center, Honolulu, HI USA

**Increasing Department of Surgery Productivity: A Study on the Effects of Adding an Ambulatory Surgery Room to Tripler Army Medical Center**

Vaseliades, Aristotle A; May 15, 2006; 65 pp.; In English

Report No.(s): AD-A473557; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473557>

In the summer of 2005 the Army Surgeon General challenged medical treatment facilities (MTFs) to increase productivity in terms of relative value units (RVUs). Tripler Army Medical Center submitted 12 initiatives, one of which was the implementation of an ambulatory surgery room within the Department of Surgery. This study examined the structure and processes used to develop this room, and the outcomes of the initiative. Problems contracting for staff to operate the room and scheduling methodology resulted in an inefficient process. Analysis of variance was used to examine differences between the ambulatory surgery room and other rooms for RVU production. 1257 cases during the months of December 2005 and January 2006 were used in the analysis. Results showed there was a statistical significance between the rooms,  $F(13,573) = 3.70$ ,  $p < .000$ . A post-hoc test revealed the room showing significance was not the ambulatory surgery room. Based on the results it is recommended the hospital look for proven ways to improve productivity before obligating money toward high risk initiatives.

DTIC

*Health; Medical Services; Surgery*

**20080002389** Baylor Univ., Houston, TX USA

**Optimizing Naval Hospital Camp Pendleton's Primary Care Access by Managing Demand of the Emergency Department through a Health Services Center: A Marcus Welby Care Initiative**

Aldana, Alexander; Jun 2006; 89 pp.; In English

Report No.(s): AD-A473562; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473562>

The number of Emergency Department (ED) visits a hospital receives is an indicator of the difficulties patients face when trying to access the healthcare system. Currently, NMCP's ED visits are at an all-time high with patients treating the ED as a walk-in clinic. This paper documents NHCP's approach to improve access by managing its ED demand through the use of a Health Service Center (HSC) and increased primary care hours. The study found that the HSC had a positive impact on decreasing the amount of non-urgent, Prime patients utilizing the ED during working hours. The new services allow the ED staff to focus their resources on those with the greatest need, while directing non-urgent patients to a more appropriate place for care.

DTIC

*Clinical Medicine; Emergencies; Health; Hospitals; Medical Services; Military Operations*

**20080002390** University Health System, San Antonio, TX USA

**Methods University Health System Can Use to Expand Medicaid Coverage to Uninsured Poor Parents with Medicaid Eligible Children: Policy Analysis**

McMahon, III, Robert T; Mar 15, 2006; 77 pp.; In English

Report No.(s): AD-A473563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473563>

Bexar County, low-income, uninsured parents with Medicaid-eligible children have been negatively impacted by reductions in Medicaid eligibility standards made by the Texas State Legislature in 2003 and the continuing reduction in local employer-sponsored insurance. The cost for providing health care to this population has fallen to Bexar County residents

through local taxes in support of the county hospital, University Health System. Alternatives to improve access to care for this population while reducing costs to the county are limited. A 1115 Medicaid waiver requiring a premium cost share with small business, employees, and county indigent care funds is currently the best long-term solution and will increase access and assist in mitigating some health care costs for the county.

DTIC

*Adults; Health; Income; Insurance (Contracts); Medical Services; Policies*

**2008002391** Madigan Army Medical Center, Takoma, WA USA

**Origins and Credibility of the Health Risk Assessment II**

Bowman, Aric; Apr 28, 2006; 109 pp.; In English

Report No.(s): AD-A473564; AMDCS-07-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473564>

The purpose of this case study is to document and describe the origins and credibility of the Health Risk Assessment II (HRA II). The unit of analysis was the HRA II, version II. The criterion for success was the establishment of a document stating the current level of credibility of the core questions on the HRA II. The results of this study have found 42 of the 76 core behavioral health questions to have either an unknown or poor level of credibility. Thirty four questions were found to have either good or at least fair credibility. Positivist and post-positivist themes are presented as a method of evaluation. A proposition to increase the credibility of future health risk assessments is posited.

DTIC

*Assessments; Health; Military Operations; Risk*

**2008002393** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Oxidation/Biodegradation of Solid Propellants Used in Legacy Chemical Rounds**

Guelta, Mark A; Beck, Andrew S; Aug 2007; 38 pp.; In English

Report No.(s): AD-A473568; ECBC-TR-537; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473568>

Nitrocellulose based compounds are the primary ingredients historically used as solid rocket and mortar propellants. These compounds were mass produced for many years and stored in bulk or configured into chemical and high-energy munitions. With the planned destruction of the U.S. chemical agent inventory, the associated propellant charges and the now antiquated propellants in storage for use in high energy rounds are awaiting disposal. Many of these propellants were manufactured over 40 years ago and are of questionable reliability. Reuse of these propellants is unlikely due to advances in more modern formulations and the economics of converting them into more usable materials. Traditional open burn/open detonation of these compounds is under pressure from more stringent environmental regulations. Biotreatment is seen by environmental and citizen groups as a friendly alternative for destruction of hazardous wastes. This report describes laboratory study where peroxone and biotreatment were successfully used to degrade neutralized propellants to near surface water regulatory requirements.

DTIC

*Biodegradation; Chemical Bonds; Oxidation; Solid Propellants*

**2008002396** Walter Reed Army Medical Center, Washington, DC USA

**Analysis of the Case Management Process at Walter Reed Army Medical Center: Procedures for Improving Case Management**

Smith, Kevin S; May 27, 2006; 52 pp.; In English

Report No.(s): AD-A473574; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473574>

This study analyzed how the case management process has functioned at Walter Reed Army Medical Center in terms of staffing, procedures, and organizational structure. The researcher conducted interviews with case managers from many areas; collected data from meeting notes, policies, regulations, and patient records; and observed the users in the day-to-day operations of the case management process. The study's results revealed that there is a lack of written procedures for case managers to follow and that communication failures are present. The lack of written procedures contributes to the variation of techniques used within the process of case management for each section. The research also revealed a misinterpretation of the definition and responsibilities of a case manager. The key to maintaining and sustaining the continuity of any process in the Military Health System is a written protocol or policy that outlines the proper procedure for the process. Despite the lack

of written procedures, the case management process at Walter Reed has provided care management to over 4,900 Operation Iraqi Freedom and Operation Enduring Freedom soldiers. The author has included some recommendations to further improve the process of case management at Walter Reed.

DTIC

*Hospitals; Management Systems; Medical Services; Military Operations; Personnel; Policies*

**20080002397** Department of Veterans Affairs, San Antonio, TX USA

**Executive Competencies of Nurses within the Veterans Health Administration: Comparison of Current and Future Nurse Executive Views**

Sutto, Natalie B; Apr 24, 2006; 70 pp.; In English

Report No.(s): AD-A473576; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473576>

This study determines if current and future nurse executives differ in their perceptions of the skills, knowledge, and abilities (SKAs) required to be successful in the role of nurse executive within the Veterans Health Administration (VHA). Using the Delphi method for executive decision-making, 144 current nurse executives, as well as 168 nurses identified for potential selection to this position, judged the relative importance of SKAs using a scale with 1 = unimportant to 7 = important. The main outcome measures were the main effects of group membership (current versus future nurse executives), differences among items within eight specific domains, and assessment of potential interaction effects for the dependent variable of SKA item importance ratings. The results show that no main effects were found for overall rating differences between the current and future nurse executive groups for any of the eight domains; however, statistically significant and systematic within-main-effect differences were detected for SKA items in all domains. The importance ratings subjects gave SKAs in the eight domains were highly similar between the two groups.

DTIC

*Health; Management Systems; Medical Personnel; Medical Services; Military Operations*

**20080002399** Army Medical Materiel Development Activity, Fort Detrick, MD USA

**Graduate Management Project. The Pursuit of Quality in Military Health Care: Are We Held to a Higher Standard?**

Rosa III, Eduardo J; Jun 20, 2006; 34 pp.; In English

Report No.(s): AD-A473580; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473580>

The Institute of Medicine (IOM) followed its *To Err is Human* and *Crossing the Quality Chasm* reports with a charge to the federal sector healthcare system to lead the way in quality initiatives. The military health system is a major player in federal sector health care serving 9.1 million beneficiaries with full-spectrum healthcare services through 76 military hospitals, over 500 military health clinics, and private sector health care partners. By outlining the ethical underpinnings for IOM's charge to federal sector healthcare, this paper adds validity to the idea that the federal and specifically the military health system has an obligation and duty to lead the way in pursuing quality health care.

DTIC

*Health; Management Systems; Medical Services*

**20080002401** Tripler Army Medical Center, Honolulu, HI USA

**Improving Provider Productivity: Impact of Coder-Coaches on Provider Documentation and Coding**

Nagra, Michael S; Jan 2006; 85 pp.; In English

Report No.(s): AD-A473582; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473582>

The MHS is beginning a dramatic shift towards controlling costs and increasing productivity. To achieve these goals, the MHS initiated the Jumpstart Program, which provided Tripler Army Medical Center \$924,000 to hire 12 coder-coaches to increase provider workload by 69,900 RVUs. The coder-coaches directly assist and coach providers in improving documentation and coding of encounters. The purpose of this study is to investigate the impact of coder-coaches on provider productivity, measured in RVUs, through improved documentation and coding at three clinics at TAMC during the first quarter (Q1) FY06. The full-model regression equation accounted for 66.73% of the variance in productivity ( $F_{4, 40} = 20.06, p < .000$ ) ANOVA showed that the family practice ( $F_{2, 8} = 18.06, p < .01$ ), orthopedic ( $F_{2, 8} = 17.23, p < .01$ ), and obstetric clinics ( $F_{2, 8} = 8.81, p < .01$ ) had higher productivity during Q1 FY06 compared to the same quarter in FY05. Specialty care setting had

higher productivity than the primary care (family practice) setting (F2, 8 = 24.92, p <.090).

DTIC

*Coders; Coding; Productivity*

**20080002403** Greater San Antonio Hospital Council, TX USA

**Study of Medical Ethics Areas of Concern in the Greater San Antonio Area**

Hurst, Laura J; Zucker, Karin W; Jun 2006; 70 pp.; In English

Report No.(s): AD-A473584; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473584>

The purpose of this study is to identify medical-ethical areas of concern faced in the hospitals of the greater San Antonio area. A modified Delphi technique was employed. First and second round questionnaires were sent to 136 chief executive officers, medical directors, chief financial officers, chief social workers, and administrators at hospitals that are members of the Greater San Antonio Hospital Council. Results indicated that the most important clinical and organizational ethics domains are (a) Patient Safety and (b) Patient Care. Within these domains, the most important ethical concerns involve (a) the reporting of medication errors and (b) documentation, respectively. Other key concerns within the clinical domains were issues related to rights and responsibilities of staff. Among the organizational domains, the most important concerns involved compliance, marketing, and billing issues.

DTIC

*Ethics; Medical Services*

**20080002415** Albert Einstein Coll. of Medicine, Bronx, NY USA

**Motor Molecule Long Term Survival in Motility Devices**

Satir, Peter; Oct 2007; 3 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0338

Report No.(s): AD-A473607; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473607>

To evaluate survival of components of a 'smart dust sensor' suitable for field deployment after cryoprotection or lyophilization and long term storage. The operational detection system employs molecular motors, particularly kinesins, to move microtubules through a series of chambers. Particularly, to evaluate the stability of assembled devices (i.e. surface adsorbed kinesin and Ab-MTs) following lyophilization.

DTIC

*Deployment; Freeze Drying; Locomotion; Survival*

**20080002416** Womack Army Medical Center, Fort Bragg, NC USA

**A Requirements Analysis for Primary Care at Womack Army Medical Center**

Asadoorian, Carol A; Jun 16, 2006; 58 pp.; In English

Report No.(s): AD-A473609; AMDCS-2-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473609>

This is a requirements analysis for primary care at Womack Army Medical Center as it endeavors to support Ft. Bragg and Pope Air Force Base's transition under Base Realignment and Closure (BRAC), the Army Campaign Plan, and the Army Transformation Plan from fiscal years 06-11. Results of this requirements analysis indicate that Womack must increase staffing, medical facilities, equipment, and funding in order to provide access to care for current beneficiaries and projected beneficiaries. It is anticipated that beneficiaries enrolled to Womack's primary care clinics will increase by 19,663 to a total of 122,720. This analysis determined that Womack must increase providers by approximately 19 full-time equivalents (FTEs) and support staff by 54 FTEs at a cost of 2.8 million to adequately support the current population. To support the increase in population, Womack must increase providers by 68 FTEs and support staff by 47 FTEs, at a cost of \$4.7 million. In addition to staff increases, Womack has determined that two additional medical treatment facilities are necessary to accommodate growth the cost for those will be \$29 million.

DTIC

*Clinical Medicine; Costs; Health; Medical Services*

**20080002417** General Hospital (121st) APO, New York, NY USA

**Same Day Surgery at the 121st General Hospital Seoul, South Korea**

Mathisen, Arthur R; Jun 2006; 66 pp.; In English

Report No.(s): AD-A473610; AMDCS-14-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473610>

The 121st General Hospital, Seoul, South Korea, is the only Army Medical Treatment Facility for all USA armed forces assigned to the Republic of Korea. The 121st currently lacks a same-day surgery program and likely has never had such a program. The purpose of this study is to analyze the variables and factors which have prevented the 121st General Hospital from implementing a same-day surgery (SDS) program, and determine if a SDS program is a feasible alternative to the current status quo. A study of surgical utilization for fiscal year (FY) 2004 was conducted. A comparison of inpatient surgeries performed at the 121st General Hospital in FY 2004 with the Centers for Medicare and Medicaid Services (CMS) most current list of approved ambulatory surgeries was completed. The results showed that 11% of the inpatient surgeries met ambulatory surgery criteria and amounted to a cost difference of \$1,663,628. The results also showed that 28% of all FY 2004 surgeries lasted less than 24 hours meeting the criteria to be coded as outpatient surgeries.

DTIC

*Clinical Medicine; Hospitals; Medical Services; South Korea; Surgery*

**20080002418** National Marrow Donor Program, Minneapolis, MN USA

**HLA Typing for Bone Marrow Transplantation**

Setterholm, Michelle; Davis, Judy W; Spellman, Steve M; Oct 31, 2007; 18 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0310

Report No.(s): AD-A473611; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473611>

Task 1 : Evaluate optimal short term storage parameters for stimulated and unstimulated leukapheresis (donor lymphocytes) and bone marrow products, including the type of storage media and the cell concentration, in addition to temperature and duration of storage before processing or infusion. Task 2: The NMDP has developed an algorithm that 'predicts' high resolution HLA typing results on donor samples that exist in the Registry with only low or intermediate results reported. Perform validation of the NMDP algorithm by selecting donors randomly from our Registry that have low or intermediate DRB1 typing results and using the algorithm to predict the high resolution results and test the ability of the algorithm to predict KIR ligand mismatching in the absence of existing HLA-C locus results.

DTIC

*Bone Marrow; Leukemias; Lymphocytes; Transplantation*

**20080002420** National Marrow Donor Program, Minneapolis, MN USA

**Quarterly Performance/Technical Report for July 1, 2007 to September 30, 2007**

Setterholm, Michelle; Sep 30, 2007; 22 pp.; In English

Contract(s)/Grant(s): N00014-06-1-0704

Report No.(s): AD-A473620; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473620>

1. Contingency Preparedness: Collect information from transplant centers, build awareness of the Transplant Center Contingency Planning Committee and educate the transplant community about the critical importance of establishing a nationwide contingency response plan. 2. Rapid Identification of Matched Donors : Increase operational efficiencies that accelerate the search process and increase patient access are key to preparedness in a contingency event. 3. Immunogenetic Studies: Increase understanding of the immunologic factors important in HSC transplantation. 4. Clinical Research in Transplantation: Create a platform that facilitates multicenter collaboration and data management.

DTIC

*Clinical Medicine; Data Management; Emergencies*

**20080002421** National Marrow Donor Program, Minneapolis, MN USA

**Quarterly Performance/Technical Report for July 1, 2007 to September 30, 2007**

Setterholm, Michelle; Sep 30, 2007; 10 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0859

Report No.(s): AD-A473622; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473622>

1. Contingency Preparedness: Collect information from transplant centers, build awareness of the Transplant Center

Contingency Planning Committee and educate the transplant community about the critical importance of establishing a nationwide contingency response plan. 2. Rapid Identification of Matched Donors : Increase operational efficiencies that accelerate the search process and increase patient access are key to preparedness in a contingency event. 3. Immunogenetic Studies: Increase understanding of the immunologic factors important in HSC transplantation. 4. Clinical Research in Transplantation: Create a platform that facilitates multicenter collaboration and data management.

DTIC

*Clinical Medicine; Data Management; Emergencies*

**20080002422** Naval Postgraduate School, Monterey, CA USA

**National Imperative to Establish a Domestic Medical Intelligence Center**

Natarajan, Nitin; Sep 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473623; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473623>

The USA does not have a centralized organization tasked with the oversight or implementation of a domestic medical intelligence program. Organizations throughout the nation have adopted a variety of definitions and operating procedures related to medical intelligence; however, they are inconsistent. Additionally, most jurisdictions limit medical intelligence to epidemiological surveillance. This thesis will propose the structure, governmental organization, data sets, and reporting for a domestic medical intelligence center. This center will require close partnership with other federal agencies and state, local, tribal, and territorial (SLTT) governments. In addition, this thesis will analyze medical intelligence operations within the Armed Forces Medical Intelligence Center, the Department of Homeland Security Office of Health Affairs, the Metropolitan Washington Fusion Center, and the Los Angeles Terrorism Early Warning Group. As this thesis shows, the development of a domestic medical intelligence center, covering a wide range of data sets, will allow for the effective collection, integration, analysis, and dissemination of both tactical and strategic actionable intelligence for federal and SLTT governments and private sector partners. These actions will assist in addressing this significant gap and increasing our nation's level of preparedness thereby improving our nation's response to large scale incidents, both naturally occurring and man-made.

DTIC

*Intelligence; Medical Services; Military Operations*

**20080002428** Congressional Budget Office, Washington, DC USA

**Estimated Costs of U.S. Operations in Iraq and Afghanistan and of Other Activities Related to the War on Terrorism**

Orszag, Peter; Oct 24, 2007; 16 pp.; In English

Report No.(s): AD-A473634; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473634>

At the request of Chairman Spratt, the Congressional Budget Office (CBO) has totaled the funding provided through fiscal year 2007 for military and diplomatic operations in Iraq and Afghanistan and other activities associated with the war on terrorism, as well as for related costs incurred by the Department of Veterans Affairs (VA) for medical care, disability compensation, and survivors' benefits. In addition to totaling the funding provided to date, CBO has projected the total cost over the next 10 years of funding operations in support of the war on terrorism under two scenarios specified by the Chairman. In scenario one, the number of deployed troops is reduced to 30,000 by 2010. In scenario two, the number of deployed troops is reduced to 75,000 by 2013. These scenarios are meant to serve as an illustration of the budgetary impact of two different courses in the war on terrorism but are not intended to be a prediction of what will occur. Including both funding provided through 2007 and projected funding under the two illustrative scenarios, total spending for U.S. operations in Iraq and Afghanistan and other activities related to the war on terrorism would amount to between \$1.2 trillion and \$1.7 trillion for fiscal years 2001 through 2017. A final section of this testimony briefly compares parts of CBO's estimate to a frequently cited estimate prepared by two academic researchers, Linda Bilmes and Joseph Stiglitz.

DTIC

*Afghanistan; Cost Estimates; Costs; Estimating; Federal Budgets; Iraq; Terrorism; Warfare*

**20080002433** Mike O'Callaghan Federal Hospital, Las Vegas , NV USA

**Holt-Winters Forecasting: A Study of Practical Applications for Healthcare Managers**

Newberne, Joan H; May 25, 2006; 37 pp.; In English

Report No.(s): AD-A473648; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473648>

Healthcare managers often encounter the need for accurate and reliable forecasts. Decisions about staffing, purchasing,

and healthcare delivery depend on the ability to analyze data and predict future observations. Qualitative methods can help with strategic planning in a changing environment; however, quantitative techniques may prove more appropriate in some cases. A basic understanding of forecast modeling can save valuable time and resources. This study demonstrates the use of the Holt-Winters model on common healthcare data series.

DTIC

*Forecasting; Management Systems; Medical Services*

**20080002434** California Univ., Davis, CA USA

**Identifying Molecular Targets for Chemoprevention in a Rat Model**

deVere White, Ralph W; Jun 1, 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0081

Report No.(s): AD-A473649; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473649>

The purpose of this grant is to determine the molecular events that occur in the dorsal and ventral lobes of the rat prostate gland after 20 weeks of exposure to PhIP (2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine). PhIP is a potent inducer of mutations in the rat prostate where we have previously shown that it forms bulky DNA adducts. The scope of this research includes: 1) Generation of a rat model, 2) Analysis of the rat prostate after 20 weeks of PhIP, and 3) Gene chip microarray analysis. To date, we have completed the histopathologic analysis of the PhIP induced prostate pathology, we have generated an inflammatory/Atrophy proliferation model, and we have acquired data that refutes a previous model of neoplastic progression. These results have been published in the journal, Neoplasia. In addition, we have completed approximately 80% of the study to investigate the molecular changes occurring in the prostate during PhIP exposure. Animal exposures have been completed and we are awaiting completion of the microarray analysis.

DTIC

*Chemotherapy; Drugs; Identifying; Rats; Targets*

**20080002435** Army Dental Command, Fort Sam Houston, TX USA

**Patient Satisfaction in Military Dental Treatment Facilities**

Chaffin, Jeffrey G; Mar 7, 2006; 110 pp.; In English

Report No.(s): AD-A473653; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473653>

This study aimed to identify predictors of satisfaction with the dentist and hygienist in military dental clinics. Respondents completed 658,443 surveys using a standardized DoD questionnaire. Factor analysis was utilized to assess the underlying constructs of satisfaction and hierarchical multiple linear regression to assess the predictive effects of the dependent variables on the three independent variables: 1) overall satisfaction with today's visit, 2) overall clinic satisfaction, 3) behavioral intent of the likelihood to return to the clinic. On a 7-point bi-polar adjective rating scale, patients' mean visit scores were 6.53 (dentist) and 6.61 (hygienist) suggesting that patients are highly satisfied. Factor analysis revealed that beliefs about care (51.5% for dentists and 46.7% for hygienists) and environment (20.1% for dentists and 26.8% for hygienists) were the most important satisfaction factors. The regression models for dentist satisfaction explained 33.8% and 31.4% of the shared variance for satisfaction with today's visit for the dentist and hygienist respectively and 34.7% and 29.1% of the variance in regards to overall satisfaction.

DTIC

*Clinical Medicine; Consumers; Dentistry; Medical Services; Patients; Statistical Analysis*

**20080002436** Louisville Univ., KY USA

**Mechanistic Studies of Oligonucleotide Aptamers With Potent Antiproliferative and Pro-Apoptotic Activity Against Prostate Cancer Cells**

Bates, Paul J; May 2007; 87 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0183

Report No.(s): AD-A473655; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473655>

G-rich oligos (GROs) are a novel class of protein-binding aptamers that selectively inhibit the proliferation of cancer cells. One of the GROs, named AS1411 (formerly AGRO100), is currently in human clinical trials for the treatment of advanced cancers. The GROs specifically target nucleolin, a multifunctional protein that is present at high levels in prostate cancer cells,



but it is not yet fully understood how binding of GROs to nucleolin inhibits cancer cell proliferation. The purpose of the project was to explore the mechanism of the AS1411 anticancer effects. The specific hypothesis being tested was that AS1411 binds to nucleolin and modulates its protein-protein interactions, leading to alterations in nucleolin function and pleiotropic biological effects. The results of this study support the validity of that hypothesis. Numerous proteins that bind to nucleolin and/or AS1411 were identified and many were found to be altered in prostate cancer cells treated with AS1411. Several novel activities of AS1411 and previously unknown complexes of nucleolin were identified. For example, AS1411 blocked NF-kappaB signaling by affecting a nucleolin complex containing NEMO/IKKgamma, and upregulation of tumor suppressor gene ST7 was linked to redistribution of a PRMT5-nucleolin complex. These new data indicate AS1411 affects the trafficking of a subset of nucleolin complexes.

DTIC

*Apoptosis; Cancer; Nucleotides; Oligomers; Oligonucleotides; Prostate Gland*

**20080002446** Hamburg Univ., Germany

**Receptor Tyrosine Kinases as Targets for Treatment of Peripheral Nerve Sheath Tumors in NF 1 Patients**

Mautner, Victor-Felix; Mar 2007; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0280

Report No.(s): AD-A473669; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473669>

NF1 is characterized by the appearance of multiple tumors of the peripheral nerve, and occasionally the malignant transformation of these tumors. The only available but unsatisfying therapy is surgical tumor resection. The purpose of this study is the preclinical testing of multiple available tyrosine kinase inhibitors for NF1-associated MPNST using in vitro and in vivo systems. Test systems are to be established. Molecular analysis of the targeted receptor tyrosine kinases will show the incidence of alterations in the receptors and provide a profile of activation of the associated pathways in MPNST. According to the patterns of receptor tyrosine kinase receptor activity appropriate inhibitors will be tested for effects on tumor growth. The findings will substantiate causal therapy attempts based on the tumor specific tyrosine kinase receptor activity profile.

DTIC

*Clinical Medicine; Enzymes; Inhibitors; Nerves; Patients; Phosphorus; Sheaths; Targets; Tumors; Tyrosine*

**20080002447** Vanderbilt Univ., Nashville, TN USA

**Radiation Sensitization Via Inhibiting Survival of Prostate Cancer and its Vascular Endothelium**

Lu, Bo; Feb 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0098

Report No.(s): AD-A473670; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473670>

We have proposed that Akt/mTOR signaling mediates cell survival and contributes to radioresistance. We intend to investigate the cellular and molecular mechanism by which inhibition of Akt/mTOR or overexpression of PTEN in both prostate cancer and its vasculature results in radiosensitization. In addition we propose to determine possible association between level or activity of these molecules and clinical response to radiotherapy. We have found differences in how irradiation affects Akt/mTOR signaling and in efficacy toward prostate cancer cells when radiation and mTOR inhibitors are combined. We found alternative death mechanisms such as autophagy are important in determining radiation sensitivity of prostate cancer cells. Furthermore we found inhibition of caspases improves radiation efficacy upon vasculature and prostate cancer cells by induction of autophagy. We plan to investigate small molecule compounds targeting these pathways for radiosensitization of prostate cancer.

DTIC

*Cancer; Cardiovascular System; Endothelium; Prostate Gland; Survival*

**20080002450** Great Plains Regional Medical Command, Fort Sam Houston, TX USA

**A Policy Analysis of U.S. Army Professional Filler System (PROFIS) Sourcing Management at the Regional Medical Command Level in Support of an Expeditionary Army at War**

Mon, Robert D; Apr 29, 2005; 94 pp.; In English

Report No.(s): AD-A473676; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473676>

The USA has been involved in the Global War on Terrorism as well as in its own Transformation since 2001. The Great

Plains Regional Medical Command (GPRMC) has been charged with providing medical support during this evolutionary time period. Unfortunately, due to the increase in mission tasking requirements over this extended period of time, this mission has become almost untenable. The increased deployment requirements being placed on active duty Professional Filler System (PROFIS) providers and the risks associated with reoccurring deployments have increased the chance of GPRMC mission failure. The purpose of this study was to analyze the current GPRMC policy concerning PROFIS management and the current expeditionary Army at War. This analysis will include an examination of the current PROFIS sourcing and tasking methodology, using PROFIS tasking data from FY 2004, and use that analysis to develop a methodology to accurately manage this resource within the region. The resulting process should reduce the turbulence in the distribution of PROFIS taskings and allow for regional visibility. The goal of this study is to have the resulting process be utilized not only by this Regional Medical Command (RMC), but by all RMCs in the U.S. Army Medical Command (MEDCOM).

DTIC

*Allocations; Deployment; Fillers; Great Plains Corridor (North America); Medical Personnel; Military Personnel; Personnel Management; Policies; Warfare*

**20080002540** USA Army Medical Information Technology Center, Fort Sam Houston, TX USA

**Enterprise Management in the U.S. Army Medical Command**

Smith, Leslie E; May 25, 2006; 53 pp.; In English

Report No.(s): AD-A473680; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The evolution of automation in business has grown to the point where centralized remote management of information technology (IT) is a necessary technique to support the business processes of an organization. The U.S. Army Medical Command (MEDCOM) manages its computer networks in a decentralized manner. Having isolated islands of technology at the separate MEDCOM agencies prohibits the central management of networked hardware and software assets. This decentralized arrangement creates expensive redundancies, contributes to the lack of standards, and provides limited asset visibility. The limited visibility enhances security risks, restricts proactive planning, and contributes to high costs. Available Enterprise Management (EM) technology facilitates the centralized management of networked assets. The MEDCOM EM plan is to establish standards and tools that will focus on software distribution, asset management, system health monitoring, and a centralized help desk. Despite more than \$200 million spent annually on Information Management/Information Technology.

DTIC

*Management Information Systems; Medical Services*

**20080002553** Oregon Health Sciences Univ., Portland, OR USA

**Environmentally Induced Gene Silencing in Breast Cancer**

Turker, Mitchell; Jul 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0579

Report No.(s): AD-A473698; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main goal of the study was to test the hypothesis that a reduction in gene expression (i.e. gene repression) could induce gene silencing (i.e. relatively stable loss of gene expression) in breast cells. Silencing of a variety of tumor suppressor genes plays a major role in the initiation and progression of breast cancer and our ultimate goal is to determine if environmentally induced gene repression plays a role as a trigger for the silencing events. The purpose of the proposed work was to confirm or refute the hypothesis. The anticipated scope of the work was to test tumor suppressor promoters known to silence in breast cancer for repression-mediated gene silencing, but we soon realized that this scope was too ambitious for a one-year funding period. We therefore changed the scope somewhat to ensure that during the funding period we could at least test the basic principle of the hypothesis. This approach was successful and we have now demonstrated that gene repression can induce gene silencing in mammalian cells. Moreover, we have recently acquired functional tumor suppressor gene promoters that are silenced in breast cancer and can use remaining funds to test these promoters for repression-induced silencing.

DTIC

*Breast; Cancer; Genes; Mammary Glands*

**20080002554** Georgetown Univ., Washington, DC USA

**In Utero Exposure to Cadmium, Mammary Gland Development, and Breast Cancer Risk**

Webster, Jennifer D; May 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0507

Report No.(s): AD-A473699; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In utero exposures to estrogen or estrogen mimics such may alter later breast cancer risk. Some of these estrogen-responsive pathways utilized during fetal development, are re-employed at times of tissue remodeling or wound healing during adulthood. These signal transduction systems effect proliferation, differentiation and apoptosis which in turn may affect later breast cancer risk. The heavy metal cadmium potently binds to and activates the estrogen receptor, having a half life in the mammalian body of over 30 years. Previous studies have shown that in utero exposure to cadmium at the levels present in some human environments accelerated puberty onset and altered some of the indicators of mammary gland development in rats. In this study we sought to determine whether in utero exposure to low doses of dietary cadmium altered puberty-related body and mammary gland development and ultimately breast cancer risk. To test this possibility, we exposed pregnant rat dams to a diet similar to the human in fat content, 30% and very low doses of cadmium, 0.075 or 0.15 mg/kg feed cadmium throughout pregnancy. The effects on (i) birth weight, (ii) postnatal weight development, (iii) vaginal opening/puberty onset, (iv) mammary gland development, and (v) DMBA-induced mammary tumorigenesis were investigated. After parturition, all rats were switched to AIN93 laboratory chow. Birth-weight was not affected by fetal cadmium exposure, but the higher cadmium dose induced a long-lasting increase in postnatal body weight that was first detected on postnatal day 5 ( $p < 0.04$ ), and it accelerated vaginal opening ( $p < 0.03$ ). Final mammary tumor incidence was highest in the higher cadmium group (80% of rats developed tumors) and lowest in the lower cadmium group (56% tumor incidence) ( $p < 0.001$ ); 73% of the control rats developed mammary tumors.

DTIC

*Breast; Cadmium; Cancer; Exposure; Fetuses; Healing; Mammary Glands; Risk*

**20080002564** State Univ. of New York, Stony Brook, NY USA

**Characterization of the Role of Breast Tumor Kinase (Brk) in Breast Cancer Cells Non-Responsive to EGFR-Targeted Agents**

Nimnual, Anjaruwee S; Jul 2007; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0448

Report No.(s): AD-A473713; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Epidermal growth factor (EGF) receptor tyrosine kinases (erbB family), EGFR (erbB1) and HER2, are highly expressed in breast cancer and are associated with poor prognosis. A number of EGFR and/or HER2-targeted agents are being investigated for breast cancer treatment. Brk (Breast Tumor Kinase) is a nonreceptor tyrosine kinase that has been shown to enhance the mitogenic signaling of EGF, induce phosphorylation of erbB 3 and interact with AKT. In this study, we aim to investigate whether Brk can promote cells to become refractory to EGFR-targeted drugs. PI-3 kinase/AKT pathway mediates EGF-induced cell growth and survival and is involved in cellular resistance to anti-cancer drugs. Because the PI3K/AKT pathway is regulated by multiple activators, downregulation of the EGFR alone may not lead to its inhibition. We will investigate whether Brk promotes growth and survival as well as PI3K/AKT activity in cells treated with EGFR-targeted agents.

DTIC

*Breast; Cancer; Drugs; Epidermis; Mammary Glands; Tumors; Tyrosine*

**20080002565** Florida Univ., Gainesville, FL USA

**Prevention of Low Back Pain in the Military: A Randomized Clinical Trial**

George, Steven Z; Childs, John D; Teyhen, Deydre S; Wu, Samuel S; Robinson, Michael E; Jun 2007; 14 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0564

Report No.(s): AD-A473714; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first year of the Prevention of Low Back Pain in the Military clinical trial has been a tremendous success as the research team was able to complete all Year 1 tasks in a timely fashion. The research team was also able to accelerate the funding schedule so that Year 2 tasks could be started resulting in the creation of a study specific website (<https://polm.ufl.edu>) that is used for general information and data collection purposes submission of a manuscript and recruitment of 1286 Soldiers by May 31st 2007.

DTIC

*Medical Services; Military Personnel; Pain; Prevention*

**20080002567** Georgia Inst. of Tech., Atlanta, GA USA

**Coimmobilization of a Redox Enzyme and a Cofactor Regeneration System**

Betancor, Lorena; Berne, Cecile; Luckarift, Heather R; Spain, Jim C; Jul 2006; 4 pp.; In English

Contract(s)/Grant(s): F08637-03-C-6006; Proj-4915

Report No.(s): AD-A473717; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The co-immobilization of nitrobenzene nitroreductase and glucose-6-phosphate dehydrogenase in silica particles enables the continuous conversion of nitrobenzene to hydroxylaminobenzene with NADPH recycling.

DTIC

*Enzymes; Immobilization; Oxidation-Reduction Reactions*

**20080002570** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Entrapment of Enzymes and Nanoparticles Using Biomimetically Synthesized Silica**

Naik, Rajesh R; Tomczak, Melanie M; Luckarift, Heather R; Spain, Jim C; Stone, Morley O; Jul 7, 2004; 3 pp.; In English

Contract(s)/Grant(s): F08637-03-C-6006; Proj-4915

Report No.(s): AD-A473721; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Entrapment of enzymes and nanoparticles using biosilification reactions.

DTIC

*Encapsulating; Entrapment; Enzymes; Nanoparticles; Silicon Dioxide*

**20080002575** Duke Univ., Durham, NC USA

**Molecular Determinants of Estrogen Receptor Alpha Stability**

DuSell, Carolyn D; Jul 2007; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0515

Report No.(s): AD-A473731; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our studies show that the ligand binding domain (LBD) of estrogen receptor alpha (ER ) is important in mediating ICI 182,780 (ICI)-induced degradation of ER . Further, we show that a single residue within helix 12 (H12) is specifically important in allowing for the degradation of ER following treatment with ICI. That this residue is not conserved between ER and ER may explain why ER does not undergo rapid ICI-mediated degradation, and may also explain why ICI is not as effective at reducing the basal activity of ER . This study is a key first step in elucidating the mechanism by which ER undergoes ligand-mediated degradation, and hopefully future studies will enable the identification of points in the degradation pathway that can be exploited pharmacologically for the treatment of breast cancer, and potentially other malignancies that are dependent upon estrogen signaling for continued growth.

DTIC

*Estrogens; Stability*

**20080002577** Texas Univ., Houston, TX USA

**Molecular Mechanism by Which Retinoids Prevent Breast Cancer Development**

Hye-Sook; Jun 2007; 60 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0505

Report No.(s): AD-A473735; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We investigated whether retinoids suppress the growth of breast cells and how they act to inhibit breast cancer development. First we measured the growth suppressive activity of retinoids (RO 25J386 LGDIO69 and LGIOO268) on the growth of breast cells (normal and malignant). Second we identified the genes induced by retinoids that could be related to the cell growth inhibition. By MTS assay we found that all three compounds (Ro25-7386, LGDIO69 and LG100268) inhibited significantly the growth of normal breast cells HMEC, at 10 uM suggesting the chemopreventive property of the retinoids. The growth of MCF-7 cells was inhibited by Ro25-7386. T47D breast cancer cells were found to be growth suppressive by Ro25-7386 and LGDIO69; they strongly suppressed the cell growth by dose-dependent manner. Surprisingly LGDIO69 also induced a mild inhibition (20 % growth inhibition) of MDA-MB-231 at 10 uM suggesting that LGDIO69 can inhibit the ER-negative breast cancer cell growth in vitro. Later we performed the Affymetrix microarray to identify the genes induced by retinoids. We found several interesting genes induced by the retinoids.

DTIC

*Breast; Cancer; Carotenoids; Mammary Glands*

**20080002585** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Forensic Discrimination of 25 Isolates of *Burkholderia mallei***

Harvey, Steven P; Minter, Jennifer M; Oct 2007; 20 pp.; In English

Contract(s)/Grant(s): Proj-4E13AA

Report No.(s): AD-A473746; ECBC-TR-577; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study, the subspecies differentiation of 25 isolates of *Burkholderia mallei* was attempted based on their ribotype polymorphisms. The isolates were from human and equine infections that occurred at various times around the world. DNA samples from each isolate were digested with PstI and EcoRI enzymes and probed with an *Escherichia coli*-derived 18-mer rDNA sequence to identify diagnostic fragments. Seventeen distinct ribotypes were identified from the combined data obtained with the two restriction enzymes. The results demonstrate the general utility of ribotyping for the subspecies identification of *B. mallei* isolates.

DTIC

*Bacteria; Deoxyribonucleic Acid; Polymorphism*

**20080002599** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Bio-Based Approaches to Inorganic Material Synthesis (Preprint)**

Slocik, Joseph M; Stone, Morley O; Naik, Rajesh R; Mar 2007; 17 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473761; AFRL-ML-WP-TP-2007-492; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nature is exquisite designer of inorganic materials using biomolecules as templates. Diatoms create intricate silica wall structures with fine features using the protein family of silaffins as templates. Marine sponges create silica spicules also using proteins, termed silicateins. In recent years, our group and others have used biomolecules as templates for the deposition of inorganic materials. In contrast to the traditional materials science approach, which requires high heat, extreme pH and non-aqueous solutions, the bio-based approaches allows the reactions to proceed usually are near ambient conditions. Additionally, the biological templates allow for the control of the inorganic nanoparticle morphology. The use of peptides and biomolecules for templating and assembling inorganics will be discussed here.

DTIC

*Biochemistry; Peptides*

**20080002602** Texas Univ., Dallas, TX USA

**The Functions of BRCA2 in Homologous Recombinational Repair**

Chen, David J; Jul 2007; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0439

Report No.(s): AD-A473770; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During this no cost extend funding period we concluded that BRCA2-Rad51 interaction is crucial for HR repair and multiple regions of BRCA2 protein are involved in regulating HR repair. A manuscript has been prepared for submission. In addition We found that upon replication stresses DNA-PKcs is phosphorylated and phosphorylated DNA-PKcs co-localizes with Brca1. The possible interaction between DNA-PKcs and Brca1 was confirmed in the co-immunoprecipitation (co-IP) analysis showing that DNA-PKcs could be co-precipitated with the alpha-Brca1 antibody. Furthermore GST-Brca1 fusion proteins covering different region of Brca1 were mixed with HeLa nuclear extract followed by co-IP with alpha-DNA-PKcs antibody and western against alpha-GST antibody. The result showed that Brca1 fragment #5 may potentially interact directly with DNA-PKcs. We plan to explore this direction in the future.

DTIC

*Breast; Cancer; Mammary Glands*

**20080002603** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

**Selection of Protease Inhibitors to Prevent or Attenuate Inflammatory Processes**

Wolterink, A F; Kieboom, J; Aug 2007; 101 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473771; TNO-DV-2007-A272; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Inflammation is a coordinated response aimed at the protection of the host at the onset of infection. In this process, human and bacterial proteases play a critical role. The regulation of human proteases is carried out by pro- and anti-inflammatory signals. Deregulation of human (metallo)peptidases results in many pathological reactions such as microbial invasion or

inflammatory tissue damage. Also bacterial proteases can influence the balance between pro- and anti-inflammatory signals and thus cause tissue damage. A disadvantage of selecting a bacterial protease inhibitor is that inflammation caused by other biowarfare agents like viruses or toxins can not be treated. It would be more appropriate to select human proteases which have a function in the coordinated response aimed at the protection of the host at the onset of an inflammatory response. The kallikrein-kinin system can modulate both the innate and adaptive immunity and could therefore represent a promising approach for the development of novel strategies to treat bacterial infections. Efforts in future research in which the blockade of kinin receptors only or in combination with other compounds might result in the development of treatment to protect the host at the onset of infection.

DTIC

*Enzyme Inhibitors; Enzymes; Infectious Diseases; Inhibitors; Peptides; Protease*

**20080002604** Inha Univ., Incheon, Korea, Republic of  
**Feasibility of Biodegradable MEMS based on Cellulose Paper**

Kim, Jaehwan; Nov 8, 2007; 7 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0207

Report No.(s): AD-A473772; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report deals with the micro-patterning process of EAPap 'Electro-Active Paper' for fabricating biodegradable and flexible MEMS. EAPap has been known as an active material with an interesting actuation phenomenon of papers. Such active materials were made by depositing very thin electrodes on both sides of cellulose paper strip. When an electric field is applied to the paper strip, a large displacement was produced. This active material has merits in terms of large strain, low voltage, low power consumption, dryness, cheap and biodegradable nature. This material can be designed in such a way that its advantages can be optimized. With these advantages and possibility, this material is attractive for biodegradable and flexible MEMS. This report illustrates a micro-patterning process on flexible EAPap material. Key issues in this biodegradable MEMS fabrication with EAPap are 1) the preparation of EAPap material for micro scale fabrication, 2) micro patterning possibility on EAPap and 3) functional capabilities of sensing and actuation. The micro contact printing for the micro-patterning on the EAPap flexible membrane is developed and its feasibility for biodegradable MEMS fabrication is investigated.

DTIC

*Biodegradability; Biodegradation; Cellulose; Microelectromechanical Systems*

**20080002607** British Columbia Univ., Vancouver, British Columbia Canada  
**Phase I/II Study of Combination Neoadjuvant Hormone Therapy and Weekly OGX-011 (Clusterin Antisense Oligonucleotide) Prior to Radical Prostatectomy in Patients With Localized Prostate Cancer**

Chi, Kim N; Aug 2007; 12 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0226

Report No.(s): AD-A473775; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The clusterin gene encodes a cytoprotective chaperone protein that promotes cell survival. Clusterin is expressed in a variety of cancers including prostate, increases in response to apoptotic stimuli, and confers a resistant phenotype. OGX-011 is a 2nd generation antisense complementary to clusterin mRNA that inhibits expression of clusterin in xenograft models and thereby increases sensitivity to therapy. To evaluate OGX-011 as a potential treatment in humans, we have undertaken this Phase I/II study to evaluate the clinical, pathologic and biologic effects of OGX-011, in combination with neoadjuvant hormone therapy (NHT) in patients with prostate cancer and high risk features prior to radical prostatectomy. The primary objective of the phase I study was to determine phase II dose based on target regulation effect. The phase II component of this trial will assess the effects of combined NHT and OGX-011 on pathologic complete response. Progress: 25 patients were enrolled to 6 cohorts with doses of OGX-011 up to 640mg delivered. Toxicity was limited to grade 1/2, including fevers, rigors, fatigue and transient AST and ALT elevations and no dose-limiting toxicities. Plasma PK analysis showed dose proportional increases in AUC and Cmax with a t1/2 of approximately 2h. Prostate tissue concentrations of OGX-011 increased with dose, and tissue concentrations associated with preclinical effect could be achieved. Dose dependent decreases in prostate cancer cell clusterin expression were observed by QRT-PCR and immunohistochemistry (IHC). At 640mg dosing, clusterin mRNA was decreased to a mean of 8% (SD=4%) compared with lower dose levels and historical controls as assessed by QRT-PCR on laser captured microdissected cancer cells. By IHC, mean % cancer cells staining 0 intensity for clusterin protein at 640mg dosing was 54% (SD=24%). Dose-dependent changes in serum clusterin were also apparent.

DTIC

*Cancer; Hormones; Patients; Prostate Gland; Radicals; Serums; Therapy*

**20080002608** Pittsburgh Univ., Pittsburgh, PA USA

**Differential MDR in Breast Cancer Stem Cells**

Donnenberg, Albert D; May 2006; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0748

Report No.(s): AD-A473776; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A new paradigm for the proliferation and metastasis of breast cancer posits a rare tumor stem cell with low proliferative index and high self-renewing potential. Like its normal counterpart, the tumorigenic stem cell gives rise to transit-amplifying daughters of high clonogenic potential. These in turn lose clonogenic potential as they follow a dysregulated differentiation program into bulk tumor. The principal hypothesis which this proposal addressed is that the bulk of breast cancer tumor cells arise from rare aberrant stem cells that share functional and phenotypic characteristics with normal tissue stem cells, including high multidrug resistance (MDR) transporter activity. Our studies were based on those of Clarke et al who isolated a rare and highly tumorigenic subset of breast cancer (BrCa) cells on the basis of expression of surface adhesion molecules (CD44+ and CD24low). In this proposal we addressed the hypothesis that these cells (or a subset thereof) have high expression of the MDR transporter ABCG2 and other stem-cell associated markers.

DTIC

*Breast; Cancer; Mammary Glands; Stem Cells*

**20080002609** Duke Univ., Durham, NC USA

**Markers of Hypoxia/Reoxygenation in the Development of Metastatic Breast Cancer**

Gamcsik, Michael P; Jul 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0610

Report No.(s): AD-A473777; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A novel in vitro cell perfusion system was designed and constructed. This system can maintain cultured breast cancer cells under conditions simulating the hypoxia/reoxygenation cycles observed in vivo. Preliminary studies suggest that breast cancer cells grown under hypoxia undergo oxidative stress as the main cellular antioxidant glutathione is depleted under these conditions. This suggests that hypoxia and reoxygenation may trigger development of the metastatic phenotype and that glutathione may be a marker for the early stages of progression.

DTIC

*Breast; Cancer; Diffusion; Glutathione; Hypoxia; Mammary Glands; Markers; Metastasis*

**20080002611** Howard Univ., Washington, DC USA

**Eosinophil Granular Protein(s) Modulate Tumor Metastasis Marker Gene Expression**

Furbert-Harris, Paulette; May 1, 2007; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0478

Report No.(s): AD-A473779; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Multicellular tumor spheroids are a suitable tumor model system for investigating the effect of anti-cancer agents on tumor growth. The overall objective of the present investigation is to examine the effect of isolated eosinophil toxic granular protein(s) and cytokines IL-4, IL-10, IL-12, TNF+/- on markers of tumor growth and metastasis (e.g. erbB2, cyclin D1, cyclin E). Early studies concentrated on the development of the spheroid model. Optimization of spheroid size, shape and number was emphasized in year 1. Of the two non-metastatic breast cell lines selected, the MCF-7 tumor line formed ideal spherical tumors, while the T-47D cells took longer to form round spheroids which were half the size of the MCF-7 MTS. The metastatic cell line MDA-MB-468 fared to grow. The data are inconclusive regarding proliferative state of the MTS fractions. They were too few cells in the early fractions. All eight eosinophil cell lines were examined and ready for batch culture for protein isolation. Additional experiments are needed for optimal standardization of the MTS models.

DTIC

*Breast; Cancer; Eosinophils; Gene Expression; Mammary Glands; Markers; Metastasis; Spheroids; Tumors*

**20080002612** Vanderbilt Univ., Nashville, TN USA

**Checkpoint Kinase-Dependent Regulation of DNA Repair and Genome Instability in Breast Cancer**

Lovejoy, Courtney A; Jun 2007; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0528

Report No.(s): AD-A473781; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DDB1, a component of a Cul4A ubiquitin ligase complex, promotes nucleotide excision repair (NER) and regulates DNA

replication. We have investigated the role of human DDB1 in maintaining genome stability. DDB1-depleted cells accumulate DNA double strand breaks in widely dispersed regions throughout the genome and have activated ATM and ATR cell cycle checkpoints. Depletion of Cul4A yields similar phenotypes, indicating that an E3-ligase function of DDB1 is important for genome maintenance. In contrast, depletion of DDB2, XPA, or XPC does not cause activation of DNA damage checkpoints, indicating that defects in NER are not involved. One substrate of DDB1-Cul4A that is crucial for preventing genome instability is Cdt1. DDB1-depleted cells exhibit increased levels of Cdt1 protein and re-replication, despite containing other Cdt1 regulatory mechanisms. Accumulation of DNA damage, re-replication, and activation of checkpoint responses in DDB1-depleted cells requires entry into S-phase and is partially, but not completely, blocked by co-depletion of Cdt1. Therefore, DDB1 prevents DNA lesions from accumulating in replicating human cells, in part, by regulating Cdt1 degradation. Loss of DDB1 function also likely inactivates the other ubiquitin-dependent mechanism of Cdt1 destruction (SCFSkp2), since active checkpoints in DDB1-depleted cells inhibit CDK activity. Thus, our data indicate that DDB1 has at least two unique and essential functions in human cells to maintain genome integrity.

DTIC

*Breast; Cancer; Deoxyribonucleic Acid; Genome; Stability*

**20080002618** Albany Medical Coll., NY USA

**Exploiting for Breast Cancer Control a Proposed Unified Mechanism for Reduction of Human Breast Cancer Risk by the Hormones of Pregnancy**

Jacobson, Herbert; Andersen, Thomas T; Bennett, James A; May 2007; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0486

Report No.(s): AD-A473791; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Results in the third grant year further support the 'Unified Mechanism Hypothesis' in that: (1) Giving pregnancy associated hormones or hCG to virgin female rats either before or after MNU treatment elicits persistent serum AFP levels, thereby explaining why breast cancer appearance is inhibited when employing either treatment sequence; (2) Giving hCG to estrogenized SCID mice bearing human breast cancer xenografts inhibits the cancer growth, apparently by action of murine AFP that the treatment has elicited from the mouse liver as an inform with low avidity for our available anti mAFP antibody. We are able to detect mAFP in mouse serum by western blot when it is present in the very high concentration that is elicited by injection of the animals with high E3 doses. (3) In an 'all-human' in vitro system, hCG elicits hAFP from cultured HepG2 human liver cancer cells, addition of the hAFP-containing supernate to cultures of MCF7 human breast cancer cells blocks their growth, and that adding anti hAFP antibody to that system prevents the inhibition. hAFP is thus confirmed as the proximal inhibitor.

DTIC

*Breast; Cancer; Hormones; Mammary Glands; Pregnancy; Risk*

**20080002620** Jackson (Henry M.) Foundation, Rockville, MD USA

**Vietnam Head Injury Study - Phase III: A 30-Year Post-Injury Follow-Up Study**

Grafman, Jordan H; Aug 2007; 95 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0675

Report No.(s): AD-A473794; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Vietnam Head Injury Study - Phase III (VHIS-P3) experienced contractual and logistical delays early on in the project but by April 2004 all contracts space allocation and IRB approvals had been obtained. Participant evaluations commenced on 27 Apr 2004 and ceased on 31 Oct 2006. A total of 199 patients and 55 controls (23 were newly recruited) were enrolled. There were 13 adverse events none of which were related to the study. Computed Tomography (CT) scans were performed on 198 subjects and electroencephalographs (EEG) on 171. To date 100 EEG and all CT reports have been received. Blood samples were collected on 252 participants for genetic analysis and 253 participants agreed to be videotaped. The National Death Index has provided information on causes of death for all Phase 2 and 3 VHIS registrants who have died and that database has been established. All participant data has been collected and entered into the VHIS master database; containing over 4500 data points per participant. All collaborators have received data sets for analysis and are currently either performing analyses or preparing manuscripts. All data has been copied and transferred to the NIH for archiving. Several presentations and manuscripts have already resulted from preliminary analyses and many more are in progress.

DTIC

*Injuries; Vietnam*



**20080002621** Pennsylvania Univ., Philadelphia, PA USA

**Using the Internet to Collaborate with Consumers in Redefining a Psychosocial Agenda for Families with Hereditary Breast Cancer**

Coyne, James C; Jun 2007; 60 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0562

Report No.(s): AD-A473796; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Women at increased risk of Hereditary Breast and Ovarian Cancers (HBOC) and their families face dilemmas about testing, risk management and family dissemination of results. They face problems regarding the accuracy of the information they have received, difficulties accessing new information and specialized services, and resistance and misinformation from inadequately informed health care professionals in the community. Thus, they are forced to develop their own informal means of individual and communal coping and to identify and access appropriate formal services without guidance. The FORCE website ([www.facingourrisk.org](http://www.facingourrisk.org)) serves important functions in the sharing of information, provision of support and active problem-solving, and in normalizing and validating the women's response to their predicament. This project is intended to yield the basis for clinically useful tools to reach out to these women and better address their unmet needs. It will identify the specific tasks with which they need assistance and the forms that competent coping takes. Results will give impetus to new clinical, public policy, and research agendas for women and their families living with inherited risk of cancer. To date, we have combined quantitative and qualitative analyses to identify and examine one of the most frequently discussed topics on the message boards; decision-making regarding the use of hormone replacement therapy (HRT) following prophylactic oophorectomy (PO). Other papers in progress include the decision to undergo prophylactic mastectomy and subsequent decisions surrounding reconstruction, the lived experience of prophylactic mastectomy, and sense of self and renegotiation of identity following prophylactic mastectomy.

DTIC

*Breast; Cancer; Consumers; Genetics; Hormones; Internets; Mammary Glands; Medical Services; Social Factors*

**20080002635** Hawaii Univ., Honolulu, HI USA

**Nutritional and Genetic Determinants of Early Puberty**

Le Marchand, Loic; Jun 2007; 6 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0575

Report No.(s): AD-A473822; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Past studies suggest that early menarche, growth velocity, and specific hormonal patterns during breast development may be critical in determining risk of breast cancer later in life. Nutritional factors during childhood and puberty, and inherited genetic factors are suspected to interact in modulating these early-life exposures. However, the biological processes involved remain poorly understood. We propose to test the relationships between nutrition, genetic factors, hormonal levels and early life events contributing to breast cancer risk in a unique cohort of 323 adolescent girls of Caucasian or Asian ancestry originally recruited for the Female Adolescent Maturation (FAM) Study. These girls were studied twice, 2 years apart, for dietary intake, body size and composition, sexual maturation, growth and bone density. Data collection will be extended by conducting a third examination and obtaining blood samples for DNA genotyping and hormone analysis. A cross-sectional sample of additional girls were also recruited. We have completed study recruitment as of 06/30/07. To date, 283 girls have come in for study visits. Of the 283 girls, 106 are from the FAM cohort and 177 are new recruits from Kaiser. During the no-cost extension, we will complete data and sample collection, complete data entry, perform laboratory assays and analyze the data.

DTIC

*Breast; Cancer; Diets; Genetics; Hormones; Mammary Glands; Nutrition*

**20080002659** Dana Farber Cancer Inst., Boston, MA USA

**Expression and Genomic Profiling of Minute Breast Cancer Samples. Addendum**

Makrigiorgos, G M; Jul 2007; 71 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0240

Report No.(s): AD-A473876; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Genetic and gene expression profiling based diagnosis promises to refine (1) and potentially revolutionize (2) the existing cancer staging system and the management of early disease. Microarray-based gene expression profiling and Array-based Comparative Genomic Hybridization (array-CGH) offers global views of cancer genomes and transcriptomes by detecting

amplification or deletion of cancer genes (3-10), whereas techniques like real time PCR (11) can be used for validation and quantification of the identified genomic changes.

DTIC

*Breast; Cancer; Genome; Mammary Glands*

**20080002660** Pennsylvania Univ., Philadelphia, PA USA

**Targeting of Drugs to ICAM for Treatment of Acute Lung Injury. Revision**

Muzykantov, Vladimir; Sep 25, 2007; 41 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0197

Report No.(s): AD-A473877; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the final fifth year, we finalized research projected for all five Specific Aims of the grant. In the Aim 1, we have analyzed the role of geometry of anti-CAM conjugates in their targeting to endothelial cells. In the Aim 2, we have characterized the roles of mode of GOX targeting, oxygen supply and biological factors controlling acute lung injury in the new mouse model developed in this grant. In the Aim 3, we characterized protective effects of targeting antioxidant enzymes in animal model of oxidative stress caused primarily by H<sub>2</sub>O<sub>2</sub> vs superoxide anion and found that targeting of catalase vs SOD provides effective protection in these cases, respectively. In the Aim 4, we completed characterization of thrombin-activated mutant fusion protein, scFv/uPA-T synthesized in the year 4. In the Aim 5, we have studied protective effects of anti-CAM/AOE and scFv/uPA-T in a mouse model of in situ lung ischemia/reperfusion, established in our group and found that targeting of both antioxidants into endothelium and pro-urokinase to endothelial surface protect the lung against oxidative and thrombotic stress in this clinically relevant model. Taken together, the data accumulated in the course of this grant and analyzed in the final report indicate that targeting of antioxidant and anti-thrombotic enzymes to endothelial CAMs affords significant advantages in treatment of pulmonary oxidative stress and thrombosis intertwined hallmarks of ALI/ARDS.

DTIC

*Drugs; Injuries; Lungs*

**20080002663** Boston Univ., Boston, MA USA

**Development of Nanomechanical Sensors for Breast Cancer Biomarkers**

Erramilli, Shyamsunder; Jun 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0578

Report No.(s): AD-A473884; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nanotechnology has the potential to develop silicon-based arrays for sensing biomarkers associated with breast cancer. Until recently breast cancer research has focused on a small number of genes or proteins as primary biomarkers. In order to develop patient-specific therapy tailored for each individual parallel detection of a large number ( $10^3$ - $10^4$ ) biomarkers may be required. The experience of the semiconductor industry in developing large scale integrated circuits at very low cost can lead to similar breakthroughs in array sensors for biomolecules of interest to the breast cancer community. Nanotechnology can meet the need for high throughput sensitive methods for rapidly recording biomarker profiles of tumors in individual patients. We report results on the development of arrays of conductance sensors of bio-functionalized silicon nanowires. For nanoscale wires such as those used in this study the change is primarily due to the contribution of surface states to the conductance. The fractional change is greatest for the smallest sensors due to the increased surface-to-volume ratio. The fabrication of arrays of conductance based sensors has now been done and the nanosensors have been characterized using model systems. The utility of these newly fabricated sensors to actual clinical breast cancer practice now remains the main goal of our project.

DTIC

*Biomarkers; Breast; Cancer; Mammary Glands*

**20080002664** National Cancer Inst., Bethesda, MD USA

**Cross Species Identification and Functional Analysis of MicroRNAs in Mammary Tumorigenesis: Potential Targets for Detection, Diagnosis and Therapy**

Green, Jeffrey E; Deeb, Kristin K; Jul 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): MIPR-6KB5MM6092

Report No.(s): AD-A473885; No Copyright; Avail.: Defense Technical Information Center (DTIC)

miRNAs have recently been identified as epigenetic elements that have important roles in development, differentiation, apoptosis and oncogenesis. Altered expression of several miRNAs have been reported in human breast cancers and may be

useful in predicting patient prognosis. The functional roles of miRNAs in tumor development and progression have not been well evaluated. The purpose of this study is to use multiple genetically engineered mouse models of mammary cancer as a filter to identify miRNAs whose expression may be evolutionarily conserved in breast cancer. Such species of miRNA that are identified through a cross-species comparison are likely to be functionally important. This study has determined the miRNA expression in multiple mouse models of mammary cancer that are based upon different initiating oncogenic events. Four general patterns of miRNA expression have been identified among the models by hierarchical clustering analyses. A distinct miRNA expression pattern has been identified for MMTV-her2/neu tumors, another for MMTV-myc tumors, whereas p53<sup>-/-</sup> tumors cluster separately from C3(1)/Tag and MMTV-PyMT tumors. Current analyses are underway to correlate changes in miRNA expression with array CGH and gene expression data from the same tumors and compare these findings to miRNA alterations in human cancer. Functional analyses are also being performed.

DTIC

*Breast; Cancer; Diagnosis; Functional Analysis; Mammary Glands; Ribonucleic Acids; Targets; Therapy*

**20080002666** Purdue Univ., West Lafayette, IN USA

**Breast Cancer and Early Onset Childhood Obesity: Cell Specific Gene Expression in Mammary Epithelia and Adipocytes**

Camarillo, Ignacio G; Nichols, Maxine; Jul 2007; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0473

Report No.(s): AD-A473889; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Obesity has become a major health problem in children and adults and is associated with increased breast cancer incidence and mortality. The epidemic of childhood obesity is recent and little information exists regarding its association with mammary tumorigenesis. Towards better understanding this relationship we have developed and characterized a new rat model of childhood onset Diet Induced Obesity (DIO) and breast cancer. We have shown that young female rats fed a high fat Western Style diet have a 24-fold higher body fat mass and elevated serum comorbidity factors as compared to Chow fed Lean rats. When these animals are treated with the carcinogen MNU mammary tumors appear sooner and in greater numbers in Obese rats. We determined via histology that tumors from Obese rats are of a more invasive type compared to tumors from Lean rats. This is in accord with the association between human obesity and breast cancer mortality. This new model parallels the onset of obesity as it occurs in humans and therefore provides an excellent system to study the underlying mechanisms of obesity and mammary tumor formation and progression. Our long-term goals are to exploit this model to better understand adipocyte-epithelial interactions during mammary tumorigenesis, identify and validate novel molecular therapeutic targets and to establish biomarkers for cancer prevention and prognosis.

DTIC

*Adipose Tissues; Breast; Cancer; Diets; Gene Expression; Mammary Glands; Obesity*

**20080002667** New York Univ., New York, NY USA

**Hypo-Fractionated Conformal Radiation Therapy to the Tumor Bed after Segmental Mastectomy**

Formenti, Silvia C; Jul 2007; 51 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-01-1-0345

Report No.(s): AD-A473890; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The IDEA grant proposal tested the feasibility of a regimen of conformal hypofractionated radiotherapy (5 fractions in 2 weeks) directed to the original tumor bed with margins in a selected subset of post-menopausal women with breast cancer with a very low risk for local recurrence elsewhere in the breast. The relevance of this approach consists of the fact that if proven equivalent in efficacy it would be more patient-friendly (30 fractions over 6 weeks) convenient and economical. This final report demonstrated feasibility in all treated patients with minimal acute side effects. Among the 69 patients with at least 6 months follow-up late effects were limited to the rare occurrence of modest fibrosis and teleangiectasia. With a median follow-up of 22.5 months in none of the patients breast cancer has recurred. Prone partial breast radiotherapy delivered by an external beam simple technique over 5 fractions was feasible and very well tolerated. These results need to be confirmed in a larger cohort of patients ideally in a multiinstitutional setting.

DTIC

*Breast; Cancer; Mammary Glands; Radiation Therapy; Tumors*

**20080002670** Georgetown Univ., Washington, DC USA

**Targeting of the Nuclear Receptor Coactivator Isoform Delta 3aib1 in Breast Cancer. Addendum**

Chien, Christopher; Jul 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0344

Report No.(s): AD-A473893; No Copyright; Avail.: Defense Technical Information Center (DTIC)

AIB1 which stands for 'Amplified in Breast Cancer' codes for a protein that is a member of the steroid receptor coactivator (SRC) family. AIB1 is amplified in approximately 5-10% of breast cancers and the mRNA and protein overexpressed in >30% of breast cancers. AIB1 interacts with a super family of ligand activated nuclear receptors to potentiate transcriptional activity leading to upregulation of downstream target gene expression. An important finding was that an isoform of AIB1 (DELTA 3AIB1) is a significantly more effective coactivator of the estrogen receptor than AIB1 and is highly overexpressed in human breast cancer. Prior work in our lab showed that the downregulation of overall levels of AIB1 plus DELTA 3AIB1, using a regulatable AIB1 directed ribozyme, resulted in reduced tumor growth in vivo. Overall, these data indicate a major role for AIB1 and its isoform DELTA 3AIB1 in breast cancer development and growth. However the relative roles of AIB1 versus the more highly active DELTA 3AIB1 in phenotypic changes in the breast has not been determined. In this investigation, we are developing a method to use siRNA directed at DELTA 3AIB1 in order investigate its role in breast cancer and as a possible future therapeutic approach to breast cancer.

DTIC

*Breast; Cancer; Estrogens; Genes; Mammary Glands; Proteins; Target Acquisition*

**20080002672** Duke Univ., Durham, NC USA

**Modulating EGFR Signaling by Targeting the Deacetylase HDAC6-Hsp90 Complex in Breast Tumors**

Yao, Tso-Pang; Jun 2007; 64 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0555

Report No.(s): AD-A473895; No Copyright; Avail.: Defense Technical Information Center (DTIC)

By facilitating the structural maturation and thereby the stability and activity oncogenic proteins such as ErbB2, the molecular chaperone Hsp90 has emerged as a promising cancer therapeutic target. Toward understanding the regulation of Hsp90 and identifying new therapeutic approach targeting Hsp90 activity we have characterized reversible acetylation as a critical mechanism that regulates Hsp90 function. Here we present evidence that Hsp90 chaperone activity is regulated by reversible acetylation and controlled by the deacetylase HDAC6. Inactivation of HDAC6 leads to Hsp90 hyperacetylation its dissociation from an essential co-chaperone p23 and a loss of chaperone activity. Using glucocorticoid receptor (GR) as a model client protein we showed that in HDAC6 deficient cells Hsp90-dependent maturation of the glucocorticoid receptor (GR) is compromised providing evidence that HDAC6-catalyzed deacetylation is critical for Hsp90 activity. Our study identifies reversible acetylation as a unique mechanism that regulates Hsp90 chaperone complex activity. Based on this observation we are now investigating whether HDAC6-regulated Hsp90 acetylation is also critical for ErbB2-induced tumor transformation.

DTIC

*Acetylation; Breast; Cancer; Mammary Glands; Modulation; Proteins; Target Acquisition; Tumors*

**20080002894** Naval Postgraduate School, Monterey, CA USA

**Compliance with Community Mitigation and Interventions in Pandemic Influenza: A Community Policing Strategy**

Alben, Sr , Timothy P; Sep 2007; 99 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473718; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A number of response plans and strategies have been published concerning preparation for an oncoming Pandemic Influenza. The majority of federal guidance and state planning with respect to pandemic preparation focuses excessively on the availability and distribution of effective vaccine and antiviral remedies; pharmaceutical solutions. Effective vaccines, presently unavailable, will not be in production and available for application for at least eight months after the onset of an identified pandemic. Community mitigations and interventions such as school closures, event cancellations, limited travel, quarantine and work at home plans are traditional responses to slowing the spread of a virus. In order to effectively implement these time tested strategies, voluntary community compliance with interventions becomes exceedingly important. The recent global experience with SARS and current mathematical modeling of virus spread characteristics support community mitigation efforts. The community policing model, having evolved over the last twenty years, provides a pre-existing framework to engage the public in grass roots pandemic education, awareness, planning and problem solving partnerships. The Incident Command System provides a structure for collaborative, multi-agency approach to successfully implementing a

community awareness and compliance initiative. Community mitigations will save lives.

DTIC

*Influenza; Pharmacology; Vaccines; Viruses*

**20080012222** California Inst. of Tech., Pasadena, CA USA

**Automated quantitative muscle biopsy analysis system**

Castleman, Kenneth R., Inventor; July 1, 1980; 12 pp.; In English

Patent Info.: Filed February 17, 1978; US-PATENT-4,210,419; US-PATENT-APPL-SN-878731; No Copyright; Avail.:

CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012222>

An automated system to aid the diagnosis of neuromuscular diseases by producing fiber size histograms utilizing histochemically stained muscle biopsy tissue. Televised images of the microscopic fibers are processed electronically by a multi-microprocessor computer, which isolates, measures, and classifies the fibers and displays the fiber size distribution. The architecture of the multi-microprocessor computer, which is iterated to any required degree of complexity, features a series of individual microprocessors P.sub.n each receiving data from a shared memory M.sub.n-1 and outputting processed data to a separate shared memory M.sub.n+1 under control of a program stored in dedicated memory M.sub.n.

Official Gazette of the U.S. Patent and Trademark Office

*Diagnosis; Diseases; Histograms; Muscles; Neuromuscular Transmission*

**20080012228** California Inst. of Tech., Pasadena, CA USA

**Ionene polymers for selectively inhibiting the vitro growth of malignant cells**

Rembaum, Alan, Inventor; March 22, 1977; 11 pp.; In English

Patent Info.: Filed February 5, 1975; US-PATENT-4,013,507; US-PATENT-APPL-SN-547234; No Copyright; Avail.:

CASI: **A03**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012228>

Ionene polymers of the structure ##STR1## WHERE X and Y ARE INTEGERS FROM 3 TO 16, Z.sup.- is an anion such as a halogen and n is an integer from 50 to 150 are found to bind negatively charged mammalian cells such as malignant cells and can be utilized to selectively inhibit the growth of malignant cells in vitro.

Official Gazette of the U.S. Patent and Trademark Office

*Integers; Halogens; Polymers; Cells (Biology); In Vitro Methods and Tests*

**20080012235** California Inst. of Tech., Pasadena, CA USA

**Ionene modified small polymeric beads**

Rembaum, Alan, Inventor; September 6, 1977; 8 pp.; In English

Patent Info.: Filed September 30, 1974; US-PATENT-4,046,750; US-PATENT-APPL-SN-510786; No Copyright; Avail.:

CASI: **A02**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012235>

Linear ionene polyquaternary cationic polymeric segments are bonded by means of the Menshutkin reaction (quaternization) to biocompatible, extremely small, porous particles containing halide or tertiary amine sites which are centers for attachment of the segments. The modified beads in the form of emulsions or suspensions offer a large, positively-charged surface area capable of irreversibly binding polyanions such as heparin, DNA, RNA or bile acids to remove them from solution or of reversibly binding monoanions such as penicillin, pesticides, sex attractants and the like for slow release from the suspension.

Official Gazette of the U.S. Patent and Trademark Office

*Beads; Halides; Porosity*

**20080012275** California Inst. of Tech., Pasadena, CA USA

**Preparation of small bio-compatible microspheres**

Rembaum, Alan, Inventor; Yen, Shiao-Ping S., Inventor; Dreyer, William J., Inventor; February 6, 1979; 9 pp.; In English

Patent Info.: Filed November 24, 1975; US-PATENT-4,138,383; US-PATENT-APPL-SN-634935; No Copyright; Avail.:

CASI: **A02**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012275>

Small, round, bio-compatible microspheres capable of covalently bonding proteins and having a uniform diameter below

about 3500 A are prepared by substantially instantaneously initiating polymerization of an aqueous emulsion containing no more than 35% total monomer including an acrylic monomer substituted with a covalently bondable group such a hydroxyl, amino or carboxyl and a minor amount of a cross-linking agent.

Official Gazette of the U.S. Patent and Trademark Office

*Bonding; Initiation; Microparticles; Polymerization; Proteins*

## 52

### AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

**20080000425** Army Research Lab., Aberdeen Proving Ground, MD USA

#### **The Effect of Continuous Operations and Various Secondary Task Displays on Soldier Shooting Performance**

Scribner, David R; Wiley, Patrick H; Harper, William H; Sep 2007; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472266; ARL-TR-4268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472266>

Soldiers will be required to perform missions with advanced information displays as the Army transforms. Soldiers will also be placed under a range of environmental stressors including continuous operations. The need to provide an information display that is operable during extended stressful conditions is crucial to the mission success of the Soldier. Optimal Soldier-system performance is desired to maximize performance and minimize errors for the end result of increased Soldier survivability and lethality. This study was performed at the U.S. Army Research Laboratory's Human Research and Engineering Directorate shooting simulator facility. The study examined the presentation of secondary task workload via an auditory display and two visual display conditions. There was also a no-workload shooting condition. The two visual display conditions consisted of a forearm-mounted display (FMD) and a helmet-mounted display (HMD), both configured with an auditory alert cue that informed the Soldier of a new math problem appearing on the display screen. Soldiers were asked to complete a secondary workload task consisting of arithmetic problems while engaged in a friend-or-foe shooting scenario with various stages of sleep deprivation. Data were collected every 6 hours for periods of 0 through 30 hours of sleeplessness. This study examined (a) the shooting performance of Soldiers during all conditions including shoot/do-not-shoot decisions, hit percentage, and response time, (b) the ability of Soldiers to complete secondary tasks in each display mode in a single and dual task paradigm, and (c) the ability of Soldiers to perform these single and dual task shooting scenarios continually for 30 hours without sleep. Participants were 12 U.S. Army Soldiers recruited from the 143rd Ordnance Battalion at Aberdeen Ground, Maryland. The shooting task consisted of a 24-target pop-up scenario with friendly and enemy E-type silhouette targets.

DTIC

*Display Devices; Helmet Mounted Displays; Sleep Deprivation; Targets*

**20080000782** Institute of Space Medico-Engineering, Beijing, China

#### **Space Medicine & Medical Engineering, Volume 20, No. 2**

Chen, Shan-guang, Editor; Wang, Xian-min, Editor; Bai, Jing, Editor; Bai, Yan-qiang, Editor; Sun, Xi-qing, Editor; Hong, Feng, Editor; Su, Hong-yu, Editor; Jiang, Shi-zhong, Editor; Su, Hong yu, Editor; Jiang-Shi-zhong, Editor; Wang, Zhi-kui, Editor; Lu, Yao-feng, Editor, et al.; April 2007; ISSN 1002-0837; 84 pp.; In Chinese; See also 20080000783 - 20080000798; Original contains color illustrations

Report No.(s): CN-11-2774/R; Copyright; Avail.: Other Sources

Topics in this issue are: An Accurately Represented Finite Element Model of Lumbar Motion Segment, Difference of Responses of Males and Females under - 30 degree Head-down Tilt, Comparison of Morphological Features in Soleus Between Tail-suspended and 30-month-old Rats, Effects of Push-pull Maneuver on GFAP Expression of Rat Brain, Specific Lysis of CTLs Induced by Dendritic Cells-added to HLA-A2 Restricted Epitopes Derived from alpha-fetoprotein Against HCC in Vitro, Preliminary Assessment of Biologic Security of a Membrane Penetrating Peptide mClock's DNA-BIND as a Drug-carrier, Effects of Degradation Products of SCPP on Migration, Proliferation and F-actin Reorganization of Vascular Endothelial Cells, Effect of 30 Hz Whole Body Vibration on Osteoporosis, A Study on the Decomposition of Surface EMG Signals Based on Second Order Non-stationary Source Separation, A Two-step MREIT Algorithm for Head Tissues Based on Radial Basic Function Neural Network, A Study on Inhomogeneous Skull Phantoms Based on Electrical Impedance

Tomography, Estimation of Uniaxial Modulus of Articular Cartilage Based on Inhomogeneous 4 Parameters Triphasic Mode, A Method for Automatic Generation of Finite Element Head Models Based on Segmented Computer Tomography Data, An Image Processing Method Used in Nystagmus Detecting System, Construction of HNP-3 Mature Peptide Bait Plasmid of Yeast Two-hybrid System and Detecting Its Self-activating and Toxic Effect, Electrochemical Recycle of NO<sub>x</sub> and CO<sub>2</sub> Emissions From Wastes Incineration for Long-term Manned Space.

CASI

*Aerospace Medicine; Physiological Responses; Gravitational Physiology; Gravitational Effects*

**20080000783** Institute of Space Medico-Engineering, Beijing, China

**Effects of Push-pull Maneuver on GFAP Expression of Rat Brain**

Wang, Hai-song; Sun, Xi-qing; Cao, Xin-sheng; Wei, Xiao-yang; Wang, Yong-chun; Geng, Jie; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 97-101; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

The objective of this study is to explore influence of the push-pull G on glial fibrillary acidic protein (GFAP) expression in rat brain astrocytes. Methods: Forty-four SD male rats were randomly divided into control group, + 10 Gz exposure group and push-pull G group. The rats were respectively killed at different time after exposure and the GFAP expression in rat astrocytes was measured by immunohistochemistry staining. Results: Compared with control group, GFAP positive reaction was medium strength, and the number of GFAP-positive cells increased significantly ( $P < 0.01$ ) in the parietal cortex, hippocampus and cerebral ganglion 6 h after + 10 Gz exposure, most of them belong to medium positive thin type; 1 d, 2 d, 4 d, and 6 d after + 10 Gz exposure, the GFAP positive reaction increased further and the number of GFAP-positive cells increased further. Compared with + 10 Gz exposure group, the GFAP positive reaction was stronger and the number of GFAP-positive cells increased significantly ( $P < 0.01$ ) at the same time after exposure to push-pull G, most of the GFAP-positive cells belong to strong positive fat type. Conclusion + 10 Gz/3 min exposure may induce significant increase of GFAP expression in rat parietal cortex, hippocampus and cerebral ganglion. GFAP expression increases more significantly after exposure to push-pull G than after + 10 Gz exposure.

Author

*Brain; Proteins; Gravitational Effects; Gravitational Physiology*

**20080000784** Institute of Space Medico-Engineering, Beijing, China

**Specific Lysis of CTLs Induced by Dendritic Cells-added to HLA-A2 Restricted Epitopes Derived from Alpha-fetoprotein Against HCC in Vitro**

Zhang, Bing; Dong, Wei; Zhu, Yue-ming; Cai, Mei-ying; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 102-105; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective: To observe specific lysis of cytotoxic T lymphocytes (CTLs) induced by dendritic cells (DCs) -added to HLA-A2 restricted epitopes derived from human alpha-fetoprotein (FMNKFIYEI, hAFP(sub 158-166)) against T2 cell lines and hepatocellular carcinoma cell (HCC) HepG2. Methods CD14(+) DC precursors were enriched with human peripheral blood mononuclear cells (PBMCs) by a modified adherence steps, then GM-CSF and IL-4 was added to adherent fraction, and on the 3rd and 5th day from beginning of culture, two kinds of cytokine were added again. On the 6th day, all nonadherent cells were harvested, then monocyte conditioned medium (MCM) was added to them. On the 8th day, the mature DCs were harvested, and led with AFP(sub 158-166) to activate CTLs, Lastly, specific lysis of CTLs against T2 and HepG2 was analysed by MTT. Results The more typical and mature DCs were obtained by an improved method of culture and the mature DCs remained stable and viable even if cultured for another 3 d in absence of this two cytokines. The CTL activated by the DCs-added to AFP(sub 158-166), can specifically strongly lysed the HepG2 and T2 cell lines led with the same epitopes, but slightly lysed the epitopes-free T2. Conclusion The DC-added, with HLA-A2 restricted epitopes derived from hAFP can induce in vitro cytotoxicity against the HepG2, it suggests the possibility that DCs can serve as a new type of vaccine for HCC.

Author

*In Vitro Methods and Tests; Toxins and Antitoxins; Immune Systems; Cancer; Antigens*

**20080000785** Institute of Space Medico-Engineering, Beijing, China

**Effect of 30 Hz Whole Body Vibration on Osteoporosis**

Li, Zhi-xiang; Zhang, Chun-lin; Tan, Cheng; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 116-119; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective To study the effect of vibration as a countermeasure against bone loss. Methods Volunteers were divided into

vibration-group(VIB) and control-group(CON). Vibration experiments were performed in VIB for 3 months(10 min/d, 5 d/week). Bone mineral density (BMD) of both VIB and CON was observed after 3 months. Results BMD in VIB increased obviously after vibration treatment (+ 1.29 % for vertebrae and + 1.65 % for femur). The effectiveness rate was 80%. Conclusion Whole body vibration is effective in countermining bone loss. It has a broad prospect in treating osteoporosis and counteracting bone loss caused by weightlessness.

Author

*Vibration Damping; Osteoporosis; Bone Mineral Content; Vibration Effects; Bone Demineralization*

**20080000786** Institute of Space Medico-Engineering, Beijing, China

**A Method for Automatic Generation of Finite Element Head Models Based on Segmented Computer Tomography Data**

Liu, Jun; Zhu, Shan-an; He, Bin; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 141-146; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

The objective of this study is to generate finite element models of the human head based on segmented computer tomography data. Methods A four-step procedure was adopted to configure the coarse mesh. The method of longest edge propagation path and the edge collapse were used to refine and optimize the final mesh. The method was evaluated by means of computer simulations in a 3-concentric- sphere head model and a three-layer realistic geometry human head model. Results The present simulation results showed reliability and rationality of the finite element computation, thus indicate the suitability of the developed method, Conclusion A multi-tissue finite element model is obtained by using this method. It can be applied to the computation of finite element based bio-mechanics and bio-electromagnetism.

Author

*Finite Element Method; Mathematical Models; Head (Anatomy); Grid Generation (Mathematics); Grid Refinement (Mathematics)*

**20080000787** Zhejiang Univ., China

**An Accurately Represented Finite Element Model of Lumbar Motion Segment**

Liu, Yao-sheng; Chen, Qi-xin; Li, Fang-cai; Tang, Xiao-jun; Fang, Jie; Liao, Sheng-hui; Yu, Shi-ce; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 79-86; In English; See also [20080000782](#)

Contract(s)/Grant(s): WKJ-2005-Z-046; Copyright; Avail.: Other Sources

The objective of this study was to construct a detailed, 3-dimensional, anatomically accurate finite element (FE) model of lumbar L(sub 4)-L(sub 5) segment from CT data with a new kind of computer aided design (CAD) method. A modified 'no-seed region segmentation' was done to extract the interest region in the CT scan images and produce a binary image. 'Best cross-section planes' accounting for the preferential direction dictated by lumbar spine were placed on the initial iso-surface model, forming a 'non-regular piecewise subspace'. This subspace and the embedded iso-surface mode were transformed by local affine transforms to a 'regular subspace', in which a surface mesh of high quality was generated quickly. Finally a reverse transform procedure was employed to recover the shape feature of the lumbar surface mesh of lumbar L(sub 4)-L(sub 5) in the original 3-dimensional space, which was then imported into ANSYS for the 3-dimensional FE mesh construction. All complicated anatomical features of the L(sub 4)-L(sub 5) segment were explicitly represented in the unprecedented finite element model. The predicted results for compression, flexion and extension correlated well with experimental data under similar loading configurations. The presented CAD method containing advanced algorithm implements fast and accurate simulation of such complicated geometry with fine mesh representation for lumbar FE analysis.

Author

*Finite Element Method; Lumbar Region; Mathematical Models; Spine*

**20080000788** Institute of Space Medico-Engineering, Beijing, China

**Comparison of Morphological Features in Soleus Between Tail-suspended and 30-month-old Rats**

Ma, Xi-ao-wu; Feng, Han-zhong; Yu, Zhi-bin; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 92-96; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective To compare the morphological differences in soleus between tail-suspended and 30-month-old rats. Methods Forty-two male rats were randomly divided into seven groups: 5 d, 7 d and 14 d tail-suspended and their synchronous control groups, 30-month-old group. The cross-sectional area(CSA) and percentage of MHC I/II fibers were measured in immunohistochemically stained sections and CSA was normalized by body weight. Results Wet weight, relative wet weight, CSA and normalized CSA in unloaded soleus decreased significantly as compared with the synchronous control. The percentage of MHC I fibers decreased, but that of MHC II fibers increased in unloaded soleus. The wet weight and CSA of



soleus in 30-month-old rats increased, but the relative wet weight and normalized CSA reduced significantly as compared with 14-day synchronous control. The relative wet weight and normalized CSA of soleus in 30-month-old rat were similar to that of 14 d tail-suspended group. The percentage of MHC I/II fibers of soleus in 30-month-old rat and in 5 d, 7 d, and 14 d of synchronous control groups kept constant value. Conclusion It's suggested that the atrophic process of soleus is slower in 30-month-old rats than that in the tail-suspended rates. The reduction of soleus relative wet weight and normalized CSA appears early in aged rats, but the absolute and relative wet weight of soleus decrease simultaneously in tail-suspended rats.

Author

*Rats; Morphology; Body Weight; Atrophy*

**20080000789** Institute of Space Medico-Engineering, Beijing, China

**Electrochemical Recycle of NO<sub>x</sub> and CO<sub>2</sub> Emissions From Wastes Incineration for Long-term Manned Space Flight**

He, Zhi-qiao; Song, Shuang; Zhou, Hua-min; Jin, Xin; Chi, Ren-fu; Chen, Jian-meng; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 154-156; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective: To develop a potential technology for simultaneous reduction of NO(x) and CO<sub>2</sub> into urea during long-term manned spaceflight. Methods: Electrochemical reduction of CO<sub>2</sub> in 0.02 mol/L KNO<sub>3</sub> aqueous solutions to urea with a Cu/Zn alloy electrode in the presence of 0.2 mol/L KHCO<sub>3</sub> was studied under different temperatures and different pressures. Results: Under normal ambient temperature, the pressure of 0.7 MPa and the electric potential of -1.7 V, the faradaic efficiency of urea formation reached a maximum value of 35.7%. Under normal ambient pressure, the temperature of 273 K and the potential of -1.4 V, the faradaic efficiency reached the highest value of 50.7%. Conclusion: Electrochemical method for the control of NO(x) and CO<sub>2</sub> emissions from solid waste incineration is effective for deep space missions.

Author

*Nitrogen Oxides; Carbon Dioxide; Manned Space Flight; Solid Wastes; Incinerators; Aqueous Solutions*

**20080000790** Institute of Space Medico-Engineering, Beijing, China

**Effects of Degradation Products of SCP on Migration, Proliferation and F-actin Reorganization of Vascular Endothelial Cells**

Chen, Yuan-wei; Shi, Guo-qi; Qin, Ying-jie; Ding, Yu-long; Yu, Xi-xun; Zhang, Xiao-hua; Wan, Chang-xiu; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 110-115; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective: To investigate the effects of degradation products (DPs) of strontium-doped calcium polyphosphate (SCP) on migration, proliferation and F-actin reorganization of vascular endothelial cells, the crucial steps in angiogenesis, and to explore the potential of SCP to promote angiogenesis in bone tissue engineering (BTE).

Author

*Tissue Engineering; Cardiovascular System; Degradation; Strontium; Calcium; Bones*

**20080000791** Institute of Space Medico-Engineering, Beijing, China

**A Two-step MREIT Algorithm for Head Tissues Based on Radial Basic Function Neural Network**

Yan, Dan-dan; Zhang, Xiao-tong; Zhu, Shan-an; He, Bin; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 126-132; In Chinese; See also [20080000782](#)

Contract(s)/Grant(s): NSF BES-0411898; NIH R01EB00178; Copyright; Avail.: Other Sources

Objective: To develop a new Two-step magnetic resonance electrical impedance tomography (MREIT) algorithm based on radial basic function (RBF) neural network for imaging electrical impedance distribution of a head. Methods: Firstly, the magnetic resonance imaging (MRI) system with high resolution was used to set up 3D model of the object and to identify the boundaries of different tissues. Then RBF MREIT algorithm was applied to estimate piece-wise homogeneous impedance values of those tissues, respectively. Furthermore, the impedance of each element within each region of the FEM model was estimated according to the RBF genetic algorithm method based on the piece-wise constant impedance. Results: Computer simulations were conducted in a three-sphere head model (scalp-skull-brain, SSB) and the simulation results showed the applicability and feasibility of the present Two-step MREIT algorithm in imaging continuous electrical impedance distribution within the head. Conclusion: The present Two-step MREIT algorithm is an effective method for imaging the continuous electrical impedance distribution within the human head.

Author

*Tissues (Biology); Genetic Algorithms; Imaging Techniques; Magnetic Resonance; Three Dimensional Models; Neural Nets; Electrical Impedance*

**20080000792** Institute of Space Medico-Engineering, Beijing, China

**A Study on Inhomogeneous Skull Phantoms Based on Electrical Impedance Tomography**

Yang, Run-ran; Wang, Cong; Shi, Xue-tao; Dong, Xiu-zhen; You, Fu-sheng; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 133-135; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective: To investigate skull phantoms with inhomogeneous distribution of conductivity based on Electrical impedance tomography(EIT) and to analyze the effect of inhomogeneous distribution of conductivity. Methods: A model of skull with inhomogeneous distribution of conductivity was established and EIT experiment was made basing on this model, then the results obtained from this model and homogeneous skull were compared. Results: As compared with the homogeneous skull model, the target in the inhomogeneous model is farther from the place where the conductivity and the variational value are lower. Conclusion: The inhomogeneous distribution of conductivity in the skull model has significant influence on the orientation of the image, and the image reconstruction algorithm should be improved.

Author

*Skull; Tomography; Electrical Impedance; Image Reconstruction*

**20080000793** BeiHang Univ., Beijing, China

**Estimation of Uniaxial Modulus of Articular Cartilage Based on Inhomogeneous 4 Parameters Triphasic Mode**

Niu, Hai-jun; Wang, Qing; Zheng, Yong-ping; Pu, Fang; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 136-140; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective To study the material attribute of articular cartilage. Methods An improved 4 parameters inhomogeneous triphasic model based on 3 parameters model was developed to estimate the uniaxial modulus  $H_a$  of cartilage and to predict the swelling pattern of cartilage. Results The results showed that more accurate uniaxial modulus can be extracted using 4 parameters inhomogeneous triphasic model, and the predicted results appeared to match the experimental strain data better than other models. Conclusion Inhomogeneous 4 parameters triphasic model can describe the depth-dependent material attribute of articular cartilage more exactly.

Author

*Cartilage; Composite Materials*

**20080000794** Institute of Space Medico-Engineering, Beijing, China

**A Study on the Decomposition of Surface EMG Signals Based on Second Order Non-stationary Source Separation**

Li, Qiang; Yang, Ji-hai; Chen, Xiang; Zhang, Xu; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 120-125; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

To investigate the decomposition method of surface EMG (sEMG) signals based on Blind Source Separation and to detect the the motor unit action potential (MUAP) information. Utilizing the sEMG signals recorded at low muscle contraction force (10% MVC), the methods of second order non-stationary source separation (SEONS) and Fast/CA were explored to analyze the sEMG signals decomposition. The experiment results showed that the MUAP information could be acquired by spike detection and pattern recognition after the decomposition of recorded sEMG signals using the proposed algorithm and Fast/CA method, but a little difference occurred due to the complexity of sEMG signals. Conclusion The non-stationary characteristic of sEMG signals is considered by the SEONS algorithm, and the proposed method can be applied in the sEMG signals decomposition.

Author

*Decomposition; Electromyography*

**20080000795** Institute of Space Medico-Engineering, Beijing, China

**Preliminary Assessment of Biologic Security of a Membrane Penetrating Peptide mClock's DNA-BIND as a Drug-carrier**

Gan, Lu; Xue, Jian-xin; Liu, Yan-you; Wang, Yu-hui; Lu, Fang; Wang, Zheng-rong; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 106-109; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective: To investigate the biologic security of a novel membrane penetrating peptide (MPP)-mCLOCK's DNA-BIND (CDB) derived from circadian protein mCLOCK's DNA-binding domain as a drug-carrier for intracellular treatment. Methods: The CDB was synthesized by chemical method. The circadian gene expression in NIH3T3 fibroblasts was induced by PMA(Phorbol 12-Myristate 13-acetate). At the indicated times, the influence of CDB on the circadian gene expression of mPeriod1 was sequently detected by RT-PCR. In addition, NIH3T3 fibroblasts were incubated with CDB directly. After 12 h or 24 h incubation, cell proliferation was detected by MTT, cell cycle and apoptosis were detected by flow cytometer.

Results: Circadian oscillation of mPeriod1 gene induced by PMA in cultured NIH3T3 cells was not influenced by CDB, and influence of CDB on cell proliferation, cell cycle and apoptosis was not observed. Conclusion: There is no toxic or adverse effect on circadian rhythm, cell proliferation, cell cycle and apoptosis in cultured cells treated with CDB. As a result, CDB can be used as a safe and efficient drug-carrier for intracellular treatment, and will have broad perspective in clinical applications.

Author

*Membranes; Peptides; Regeneration (Physiology); Chemical Analysis; Gene Expression; Deoxyribonucleic Acid; Apoptosis*

**20080000796** Institute of Space Medico-Engineering, Beijing, China

**Difference of Responses of Males and Females under -30deg Head-down Tilt**

Lu, Li-li; Wu, Bin; Wu, Ping; Gu, Zhi-ming; Wang Yan-lei; Liu, Xing-hua; Tang, Yun; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 87-91; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Objective: To find out the difference of responses to HDT between females and males of different occupations. Methods: Healthy female employees (group A, n = 11) and female pilots (group B, n = 10) and male special pilots (group C, n = 14) and male employees (group D, n = 7) were tested with -30deg head-down tilt for 45 min. Results: Heart rate (HR) of females and males all decreased with time during HDT, especially male employees group and female pilots group ( $P < 0.05$ ); SBP and MBP of male special pilots were significantly higher than both groups of female ( $P < 0.05$ ), and their DBP are higher than those of female pilots ( $P < 0.05$ ); HR and BP of male employees are higher than female employees ( $P < 0.05$ ). DBP and MBP of female employees increased significantly ( $P$  approx. 0.01). Symptoms of females to HDT were less than those of males. Conclusion: Reaction of HR in females to the HDT are similar to males; there is difference in regulation of blood pressure between males and females, also between females of different occupations. Symptom of subject may be one of the factors for determining the tolerance to HDT.

Author

*Physiological Responses; Heart Rate; Blood Pressure*

**20080000797** Institute of Space Medico-Engineering, Beijing, China

**An Image Processing Method Used in Nystagmus Detecting System**

Wang, Huan; Shi-Yi-kai; Yao, Qin; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 147-150; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

The objective of this work is to study an image processing method that can detect nystagmus non-invasively and do vertigo judgement in real time and without damage. Methods The eye pictures were processed by video image method, which contained pick-up of characteristic weight, transform of threshold value, image erosion, etc. When the positions of pupil were confirmed, Assistant Picture-box method was used to draw the curve of these positions. Results The pupil was detected rapidly and accurately by this method. Also the fluctuation was shown in real time. Conclusion As is shown in the experiment, this method can meet the requirement of detecting the position of pupil accurately, in real time and without damage. The achievement has provided important basis for vertigo judgement.

Author

*Detection; Image Processing; Nystagmus; Eye (Anatomy); Pupils*

**20080000798** Institute of Space Medico-Engineering, Beijing, China

**Construction of HNP-3 Mature Peptide Bait Plasmid of Yeast Two-hybrid System and Detecting Its Self-activating and Toxic Effect**

Ma, Sheng-xiu; Deng, Lu-xia; Luo, Lin; Peng, Yuan-yuan; Lu, Hui-xia; Zhang, Min; Xiong, Wen-bi; Feng, Yun; Wu, Qi; Wang, Bo-yao; Huang, Ning; Space Medicine & Medical Engineering, Volume 20, No. 2; April 2007, pp. 151-153; In Chinese; See also [20080000782](#); Copyright; Avail.: Other Sources

Abstract: Objective To construct the bait plasmid of HNP-3 mature peptide in yeast two-hybrid system and examine whether the recombinant bait plasmid has self-activating and toxicity effect. Methods Using RT-PCR technique, the cDNA fragments of HNP-3 mature peptide gene were amplified from the extracted RNA in cultured HL-60 cells. The fragment was firstly cloned into pBluescript-SK-II vector, confirmed by sequencing, then sub-cloned into the bait plasmid pGBKT7 and identified with PCR and sequence analysis techniques. The recombinant plasmid was introduced into the yeast cell AH109, and its self-activating and toxicity effect was tested by auxotrophic selective culture. Results DNA sequencing indicated that the inserted fragment in pBluescript-SK-II vector was HNP-3 mature peptide gene sequence, and the sub-cloned recombinant

pGBKT7-HNP-3 was no mismatch. The recombinant bait plasmid didn't have self-activating effect and did not show toxicity to yeast AH109 cell. Conclusion The bait plasmid of HNP-3 mature peptide was constructed successfully. This was helpful for investigating the proteins interacting with HNP-3 mature peptide by yeast two-hybrid technique.

Author

*Peptides; Ribonucleic Acids; Sequencing; Deoxyribonucleic Acid; Complementary DNA; Cells (Biology)*

**20080000876** Institute of Space Medico-Engineering, Beijing, China

**Space Medicine & Medical Engineering; Vol. 19 No. 6**

Chen, Shan-quang, Editor; Wang, Xian-min, Editor; Bai, Jing, Editor; Bai, Yan-qiang, Editor; Sun, Xi-qing, Editor; Hong, Feng, Editor; Su, Hong-yu, Editor; Jiang, Shi-zhong, Editor; Wang, Zhi-kui, Editor; Lu, Yao-feng, Editor, et al.; December 2006; ISSN 1002-0837; 98 pp.; In Chinese; See also 20080000877 - 20080000895; Original contains black and white illustrations

Report No.(s): CN 11-2774/R; Copyright; Avail.: Other Sources

Articles in this issue are: Effects of Psoralen on Improving Chemotherapeutics Drug's Concentration of HL60 Cells, Recurrence Quantification Analysis of Blood Pressure Signal in Rats after Simulated Weightlessness, Effects of Simulated Weightlessness on Activity of ERK Induced by BMP-2 in ROS17/2.8 Cells, Sympathetic Responses in Caloric Stimulation : Role in the Cardiovascular Control of Anesthetized Rats, Induced Cardiomyogenic Differentiation of Bone Marrow Mesenchymal Stem Cells in Vitro, Evaluation of Joint Motion Based on Perceived Discomfort, Selection of Salad Vegetables in Controlled Ecological Life Support System, Numerical Simulation of CO<sub>2</sub> Removal with Carbon Molecular Sieve for Use in Portable Life Support System, An Automatic Image Co-registration Algorithm Based on Signal Correlation Function and Artificial Neural Network, Experimental Study on Dependence of Diffusion Tensor-derived Parameters upon Diffusion Time, A System for Measurement of Pulse Wave Transit Time Continuously Based on Wireless Sensor Network, Data Analysis of Multi-frequency Electrical Impedance Scanning by Cole-Cole Model, Responses of Cultured Neuronal Network to Electric Pulses Stimuli with Different Intervals, A Novel Method for Effectively Preserving PPG Pulse Waveform Information, Application of Fluctuation Complexity Measure to Speech Endpoint Detection, A Study on Method for Building Human Head Parameter Model, Analysis of Mental Fatigue Based on Approximate Entropy of EEG, PMA-induced Circadian ≠ Expression of rPer1, rDbp in C6 Cells, and Research Progress in Space Hematology

CASI

*Aerospace Medicine; Life Support Systems; Bioastronautics; Cardiovascular System*

**20080000877** Institute of Space Medico-Engineering, Beijing, China

**Data Analysis of Multi-frequency Electrical Impedance Scanning by Cole-Cole Model**

Liu, Rui-gang, Editor; Shi, Xue-tao, Editor; Fu, Feng, Editor; You, Fu-sheng, Editor; Ji, Zhen-yu, Editor; Dong, Xiu-zhen; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 438-441; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To study analysis method for data from multi-frequency electrical impedance scanning (EIS). Method: The Cole-Cole equation in form of admittance adapting for electrical impedance scanning was deduced by the classical Cole-Cole empirical equation in form of impedance. Parameter evaluation of Cole-Cole model in form of admittance by least square method was obtained. Result: The curve of Cole-Cole in form of admittance of human measurement data fits well with the least square evaluated arc. 3D distribution plots of the 4 parameters of Cole-Cole model in the form of admittance using human measurement data on the same electrode array were made according to the location of the electrodes. Conclusion: The curves of Cole-Cole in form of admittance on different electrode can reflect the change of trans-admittance caused by the change of the driving frequency. The 3D distribution plots of the 4 parameters of Cole-Cole in form of admittance are able to explain the measured result of electrical impedance scanning by independent physical meanings respectively. They are helpful to diagnose diseases accurately.

Author

*Electrical Impedance; Frequencies; Least Squares Method*

**20080000878** Institute of Space Medico-Engineering, Beijing, China

**PMA-induced Circadian Gene Expression of rPer1, rDbp in C6 Cells**

Xue, Jian-xin; Gan, Lu; Lu, Fang; Liu, Yan-you; Xiao, Jing; Wang, Yu-hui; Wang, Zheng-rong; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 462-464; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To investigate the expression level of circadian gene in C6 glioma cells by searching for a novel

rhythm-inductor in vitro. Method: In order to compare the induction efficiency of PMA with horse serum ,the cultured NIH-3T3 cells were stimulated by PMA(phorbol 12-myristate 13-acetate, 100 nmol/L) and 50% horse serum respectively and performed RT-PCR to examine the expression of mPer1 mRNAs at the indicated times. The cultured C6 glioma cells were also stimulated by PMA and examined the expression of rPer1, rDbp mRNAs at the indicated times by RT-PCR. Result: Both PMA and 50% horse serum could induce the circadian gene expression of mPer1 in NIH-3T3 cells and achieved similar induction efficiency ,and it was confirmed that circadian oscillation of mPer1, rDbp existed in C6 glioma cells. Conclusion: PMA is an effective rhythm inductor in vitro, and elicit the circadian oscillation of clock genes in C6 glioma cells, which confer an advantage to the investigation of circadian entrainment mechanisms in vitro.

Author

*Gene Expression; Circadian Rhythms; Cells (Biology)*

**20080000879** Institute of Space Medico-Engineering, Beijing, China

**A Study on Method for Building Human Head Parameter Model**

Gao, Song-feng; Zhang, Chun-lin; Li, Zhi-xiang; Lian, Ying; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 456-458; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To find a method for building a human head parameter model. Method: Raw data of human head were acquired and filtered, a linear regression equation was formulated, and a parameter model was established. Result: A human head parameter model was built. Conclusion: A human head parameter model can be built by using the linear regression equation of human head to adjust the initial CT data, and a three-dimensional and human head parameter model can be built by OpenGL.

Author

*Parameterization; Head (Anatomy); Linear Equations*

**20080000880** Institute of Space Medico-Engineering, Beijing, China

**A System for Measurement of Pulse Wave Transit Time Continuously Based on Wireless Sensor Network**

Ji, Jun; Yu, Meng-sun; Xiang, Hai-yan; Liu, Yan-yong; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 434-437; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To design a system for monitoring pulse wave transit time (PWTT) in working condition non-intrusively and continuously. Method: The system was composed of wireless ECG sensor and wireless pulse wave sensor which measure pulse wave signal from the temporal artery and ECG signal from body synchronously and calculates PWTT continuously. Result: Both the wireless ECG sensor and the wireless pulse wave sensor were small sized and powered by button battery. And the accuracy of time synchronization about sensors was less than 1 ms. The calculated PWTT changed slowly with deep breathing. Conclusion: The system works smoothly for continuous monitoring of PWTT in working condition.

Author

*Transit Time; Electrocardiography; Time Synchronization; Heart Rate*

**20080000881** Institute of Space Medico-Engineering, Beijing, China

**A Novel Method for Effectively Preserving PPG Pulse Waveform Information**

Weng, Jian-feng; Ye, Zhi-qian; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 447-451; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To reduce information loss in the refining processing of photoplethysmographic (PPG) pulse waveform. Method: A novel PPG pulse waveform refining processing technique, named truncation/extrapolation technique was proposed. The key point of the proposed technique was to preserve the shape pattern of the most significant parts of the waveform at the expense of the distortion of the insignificant part. Thus as compared with the conventional time-normalization method, the proposed technique ensured the accumulation coherent of the signal energy could be. Result: Waveform analysis and comparison of experimental data between two methods verified the effectiveness of the proposed method in maintaining the most significant time domain features of the pulse waveform over a relatively wide range of the heart rate change, especially the shape and width of the dominant peak and the position of the dicrotic notch of the first derivative of PPG(dPPG) . Conclusion: The proposed method reduces the information loss in PPG pulse waveform refining processing, thus helps further processing of the PPG signal using some advanced signal processing techniques, such as waveform modeling and pattern recognition.

Author

*Waveforms; Signal Processing; Pattern Recognition; Data Processing; Extrapolation; Heart Rate*

**2008000882** Institute of Space Medico-Engineering, Beijing, China

**Effects of Simulated Weightlessness on Activity of ERK Induced by BMP-2 in ROS17/2.8 Cells**

Wang, Bing; Cao, Xin-sheng; Wu, Yan-hong; Yang, Zhi; Zhang, Shu; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 399-402; In Chinese; See also [2008000876](#); Copyright; Avail.: Other Sources

To investigate the effects of simulated weightlessness on activity of ERK and expression of c-fos/c-jun mRNA induced by bone morphogenetic protein-2 (BMP-2) in ROS17/2.8 cells. ROS17/2.8 cells were cultured in 1 G condition or on a clinostat (to simulate weightlessness) rotated for 24 h and 48 h with or without BMP-2 (500 ng/ml) in the culture medium. Total protein of the cells was extracted and the expression of p-Elk was analyzed by means of immuno-precipitation and Western Blotting to examine the kinase activity of ERK. Total RNA of the cells was extracted and the expression of c-fos/c-jun mRNA was analyzed by RT-PCR. The content of p-Elk in the cells cultured with BMP-2 was much more than that without BMP-2 either in 1 G or in simulated weightlessness groups. The level of p-Elk in simulated weightlessness groups was much lower than that in 1 G group cultured for 24 h or 48 h. The level of BMP-2 induced expression of c-fos mRNA was significantly lower in simulated weightlessness group than that in 1 G group after 24 h (P less than 0.05) or 48 h (P less than 0.01). The level of c-jun mRNA was significantly lower in 48 h simulated weightlessness group (P less than 0.01). The BMP-2 can induce kinase activity of ERK and expression of c-fos/c-jun mRNA in rat osteosarcoma cells are reduced under simulated weightlessness.

Author

*Weightlessness Simulation; Aerospace Medicine; Bones; Proteins; Morphology; Genetics; Cells (Biology)*

**2008000883** Institute of Space Medico-Engineering, Beijing, China

**Responses of Cultured Neuronal Network to Electric Pulses Stimuli with Different Intervals**

Chen, Chuan-ping; Chen, Lin; Lin, Yun-sheng; Zeng, Shao-qun; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 442-446; In Chinese; See also [2008000876](#); Copyright; Avail.: Other Sources

Objective: To analyze the activities of cultured neuronal network in response to electric pulses stimuli with different intervals. Method: Pairs of electric pulses with different intervals were added to rat hippocampal neurons cultured on multi-electrode arrays (MEA) substrate. Result: The second response duration of the network increased with the decrease of the interval between two pulses. It was typical that the second duration after pulses with 10 ms interval increased greatly and it could be divided into two stages, i.e., quick response (within 10 ms) and slow response (near or beyond 100 ms). However, following pulses with 100 ms interval, there is practically no relation between the two responses; the second response duration was shorter and the number of spikes was fewer and their amplitudes were lower, which is similar to the result of single electric pulse stimulus. Conclusion: The activity of cultured neuronal network was different in response to different electric stimulation patterns. Compared with spontaneous firing, the activity of the network is potentiated or depressed respectively after different stimulations.

Author

*Neurons; Electric Pulses; Neurophysiology*

**2008000884** Institute of Space Medico-Engineering, Beijing, China

**Experimental Study on Dependence of Diffusion Tensor-derived Parameters upon Diffusion Time**

Zhang, Huai-ling; Li, Yuan; Wang, Xiang; Gao, Song; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 430-433; In Chinese; See also [2008000876](#); Copyright; Avail.: Other Sources

Objective: To investigate the relationship between diffusion time and diffusion tensor-derived parameters. Method: Diffusion tensor data sets were obtained from 11 healthy volunteers using 8 different levels of diffusion time while keeping the diffusion sensitive gradient magnetic field strength fixed. Diffusion tensor-derived parameters with variant diffusion time for six regions of interest were calculated and compared. Result: There was statistically significant difference in mean diffusivity (MD) of variant diffusion time ( $P < 0.05$ ), but fractional anisotropy (FA) were diffusion time independent ( $P > 0.05$ ). Conclusion: There is no diffusion time dependent in FA, but MD are diffusion time dependent. The reason may be attributed to the difference of the diffusion properties between the intra- and extra-cellular water molecules.

Author

*Time Dependence; Diffusion; Diffusivity; Magnetic Flux; Gradients; Tensors*

**2008000885** Institute of Space Medico-Engineering, Beijing, China

**Application of Fluctuation Complexity Measure to Speech Endpoint Detection**

Fan, Ying-le; Wu, Chuan-yan; Li, Yi; Pang, Quan; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 452-455; In Chinese; See also [2008000876](#); Copyright; Avail.: Other Sources

Objective: To find a useful index for real-time detecting of speech endpoint and improving the performance of speech

processing under low SNR by analyzing fluctuation complexity of speech signals. Method: The influence of state space partition method, window size and partition numbers on detecting performance was analyzed. The comparison experiments of speech signals corresponding to different SNR and noise type was designed using the measure of complexity behaviors based on the information gain. Result: It was found that fluctuation complexity was more effective in detecting low-SNR speech than spectral entropy. Conclusion: Fluctuation complexity is a valid feature to make speech/non-speech decision for the low SNR cases. The presented method can achieve robust performance and has a good real-time behavior.

Author

*Real Time Operation; Speech; Entropy*

**20080000886** Institute of Space Medico-Engineering, Beijing, China

**Evaluation of Joint Motion Based on Perceived Discomfort**

Zhang, Li-bo; Yuan, Xiu-gan; Wang, Li-jing; Dong, Da-yong; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 412-416; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

To evaluate the discomfort degree of some joint motions. Joints and joint motions were selected by referring to the national military standards. Twenty healthy male subjects participated in the experiment, discomforts for varying joint motions in standing and sitting postures were measured using the free modulus magnitude estimation. Relative discomfort index were deduced to described overall change of discomfort degree of joint motions. Perceived discomfort were affected by the joints, type of joint motions, and angle of motion. Results showed that the most comfort joint motions existed in the joint of shoulder and the most discomfort motion was in the hip in the experiment. The method and result in this study can provide reference and guidance for ergonomical evaluation by aviation design department, and drawing up of the military standards about postures comfort.

Author

*Comfort; Human Factors Engineering; Motion; Posture; Joints (Anatomy)*

**20080000887** Institute of Space Medico-Engineering, Beijing, China

**Research Progress in Space Hematology**

Li, Zhi-li; Jiang, Shi-zhong; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 465-468; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Spaceflight exerts substantial effects on several systems in humans. The hematologic abnormalities include mainly reduction in plasma, blood volume and red cell mass et al. The initial studies were focus on the changes in hematologic parameters. However, further studies on the physiological mechanisms of these effects showed substantial progress recently. The new mechanism called neocytolysis of physiological down-regulator of red cell mass was discovered. This review summarizes briefly the recent research findings.

Author

*Hematology; Aerospace Medicine; Research; Physiology; Regulatory Mechanisms (Biology)*

**20080000888** Institute of Space Medico-Engineering, Beijing, China

**Numerical Simulation of CO<sub>2</sub> Removal with Carbon Molecular Sieve for Use in Portable Life Support System**

Han, Ying; Lin, Gui-ping; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 422-424; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

To establish a numerical model of adsorption and desorption of CO<sub>2</sub>, and to study the influencing factors on the removal system. A physical model was expressed by mathematical method, then an isothermal adsorption model for simulating molecular sieve was established. The working process of a CO<sub>2</sub> removed device was simulated and its result was analyzed with the established model. The characteristics of the adsorption and desorption was obtained. The model describes the processes correctly, the influencing factors like humidity dimension of the bed are considered simultaneously. It remains to be improved by further experimental corrections.

Author

*Carbon Dioxide Removal; Direct Numerical Simulation; Mathematical Models; Absorbents; Portable Life Support Systems*

**20080000889** Institute of Space Medico-Engineering, Beijing, China

**Induced Cardiomyogenic Differentiation of Bone Marrow Mesenchymal Stem Cells in Vitro**

Huang, Yan; Li, Ying-hui; Yang, Fen; Dai, Zhong-quan; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 408-411; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

To investigate the effect of 5-azacytidine on cardiomyogenic differentiation of bone marrow mesenchymal stem cells

(BMSCs). BMSCs were isolated from the marrow of adult SD rat's femoral /tibial bones. Different concentration of 5-azacytidine were added to primary BMSCs on 3 d and cultured for different times. Cardiomyogenic differentiation of BMSCs was observed by immunohistochemistry and RT-PCR. After treated with 5-azacytidine, BMSCs proliferated slowly, became spindle-shaped after 10 d and aligned in a striated pattern after 20 d. TnT positive cells were showed by Immunohistochemistry and they expressed two cardiac-marked genes GATA-4 and p-MHC. Thus 5-azacytidine induced cardiomyogenic differentiation of BMSCs in a time and concentration-dependent manner. Our study suggests that bone marrow mesenchymal stem cells can differentiate into cardiomyocytes in vitro. They are ideal donor cells in cellular cardiomyoplasty for treatment of myocardial infarction.

Author

*Bone Marrow; In Vitro Methods and Tests; Myocardial Infarction; Stem Cells; Immunology; Histochemical Analysis; Cardiology; Myocardium*

**20080000890** Institute of Space Medico-Engineering, Beijing, China

#### **Selection of Salad Vegetables in Controlled Ecological Life Support System**

Qin, Li-feng; Guo, Shuang-sheng; Ai, Wei-dang; Tang, Yong-kang; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 417-421; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

To select suitable vegetable for use in Controlled Ecological Life Support System for future long-term space missions. Five crops of lettuce (four *Lactuca sativa* L. var. *crispa* L. and one *Lactuca sativa* L. var. *longifolia* Lam), two crops of spinach (*Spinacia oleracea* L.), one rape (*B. mpus* L.) and one common sowthistle (*Sonchus Oleraceus* L.) were grown in a Controlled Ecological Life Support Technique Experimental System. Hydroponic nutrient solution, light, temperature and relative humidity were regulated, CO<sub>2</sub> levels were controlled at 500, 1000, 1500 and 2000 micromol/mol, and light intensity were controlled at 100, 300, 500 and 700 micromol/(square meters (raised dot) s). Canopy photosynthetic rate, transpiration rate and leaf area were measured on day after planted (DAP) 25 and 30. Plants were harvested at maturity, and analyzed for total fresh weigh and proximate composition (crude fiber, nitrite and beta-carotene). Three crops of lettuce 'nenlvnaiyou', 'dagusheng heng', 'youmaicai', and one common sowthistle were selected. The favorite CO<sub>2</sub> concentration and light intensity 2000 micromol/mol, and 700 micromol/( square meters (raised dot) s) respectively. The four crops selected have high productivity, photosynthetic rates and transpiration rates, which can be considered as the basis of the vegetables to be used for future long-term space missions.

Author

*Vegetables; Aerospace Medicine; Ecosystems; Farm Crops; Closed Ecological Systems*

**20080000891** Institute of Space Medico-Engineering, Beijing, China

#### **An Automatic Image Co-registration Algorithm Based on Signal Correlation Function and Artificial Neural Network**

Liu, Jun; Zhu, Shan'an; Bin, He; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 425-429; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

To co-register multi-modal serial images by non-rigid transforming. A new conception of signal process was introduced to the procedure of medical image registration. The edge of two frames of medical images as two rows of random signals that have time delay characteristics was described. With the correlation function of the signal as the measure, the transform relationship between the two images was optimized by means of an artificial neural network. This method was successfully developed for brain image co-registration. Computer simulations were conducted and the simulation results demonstrated that the co-registration error was smaller than one pixel. Furthermore, the present method had fewer parameters to be optimized, less time consumed and were more automatic than other co-registration methods. Finally, it was demonstrated that the present method can successfully co-register the post-operative CT images with the pre-operative MRI images in a patient's undergoing neurosurgical operation. This method provides a new useful tool for multi-modal medical images co-registration.

Author

*Algorithms; Correlation; Image Processing; Neural Nets; Aerospace Medicine; Artificial Intelligence; Neurology*

**20080000892** Institute of Space Medico-Engineering, Beijing, China

#### **Analysis of Mental Fatigue Based on Approximate Entropy of EEG**

Zhang, Chong; Zheng, Chong-xun; Yu, Xiao-lin; Li, Xiao-ping; Shen, Kai-quan; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 459-461; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To explore the influences of work and sleep deprivation on mental fatigue; To investigate the relationship between Approximate Entropy (ApEn) of Electroencephalogram (EEG) and mental fatigue by analyzing ApEn of EEG under



different mental fatigue status and to find a feasible index for analyzing the mental fatigue level. Method: ApEns of EEG are analyzed under different levels of mental fatigue to explore the rule of variation and relationship with mental fatigue level. Result: Average ApEn reduced with the increase of mental fatigue level. The prolonged time and increased intensity of work have a greater effect on mental fatigue than that of simple sleep deprivation. Conclusion: It is feasible to analyze mental fatigue by ApEn of EEG, which reduces with the increase of mental fatigue level. ApEn of EEG is expected to serve as the index for detecting mental fatigue level.

Author

*Electroencephalography; Entropy; Sleep Deprivation; Fatigue (Biology)*

**20080000893** Institute of Space Medico-Engineering, Beijing, China

**Sympathetic Responses in Caloric Stimulation: Role in the Cardiovascular Control of Anesthetized Rats**

Wang, Lin-jie; Dong, Wei-jun; Zhang, Dan; Zhao, Qi; Tong, Fei-zhou; Cao, Yi; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 403-407; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

To explore the potential connection between sympathetic response, heart rate and blood pressure modulation after caloric irrigation in order to study the role of vestibular stimuli in cardiovascular control. Efferent splanchnic nerve firing rates, ECG and blood pressure were recorded simultaneously during caloric stimuli on intact anesthetized (CON) rats (n = 5), sinoaortic denervated (SAD) rats (n = 5) and bilateral vestibular destroyed (VD) rats (n = 5). It was found that after caloric stimulation with ice water mean blood pressure CON rats with intact reflex became lower and the mean heart rates became slower, splanchnic sympathetic nerve activities increased for a moment and then dropped significantly. SAD rats had significant stronger splanchnic sympathetic nerve activities VD rats after caloric stimulation, and their blood pressures changed to apposite directions. The coupled respiratory component on splanchnic sympathetic nerve activities were strongly affected by the caloric stimulation. It is suggested that semicircular canal stimulation participate at least in the short-term blood pressure control mechanism and the role of central nervous system on respiratory drive may also be involved. Baro-reflex and vestibular afferent may play different role in the control of blood pressure they may work synergically in some physiological control processed.

Author

*Cardiovascular System; Anesthetics; Electrocardiography; Aerospace Medicine; Sympathetic Nervous System; Caloric Stimuli*

**20080000894** Institute of Space Medico-Engineering, Beijing, China

**Recurrence Quantification Analysis of Blood Pressure Signal in Rats after Simulated Weightlessness**

Liu, Xin; Cheng, Jiu-hua; Lu, Hong-bing; Zhang, Li-fan; Ma, Jin; Dong, Xiu-zhen; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 394-398; In Chinese; See also [20080000876](#); Copyright; Avail.: Other Sources

Objective: To evaluate whether changes in cardiovascular regulatory function induced by simulated microgravity can be detected by recurrence plot analysis (RPA) and recurrence quantification analysis (RQA) of blood pressure signals obtained from conscious rats. Method: The tail-suspended rat model was used to simulate the cardiovascular effect of microgravity for 14 d. Blood pressure (BP) data were recorded by a pressure transducer connected to a PE-50 - PE-10 catheter chronically inserted via the right femoral artery into the posterior abdominal aorta in conscious rats. Nonlinearity in BP signals were studied using recurrence plot analysis and then quantified by three nonlinear indexes, namely % REC (percentage of recurrence), % DET (percentage of determinism), and L(sub max)(length index) extracted from the BP signal. Result: Compared with that of control group (CON), the three nonlinear indexes were significantly decreased in the tail-suspended group (SUS) ( $P < 0.05$  or  $0.01$ ), and indicated that the fluctuation of blood pressure tended to be in a more chaotic state. In CON, the values of % REC, % DET, and L(sub max), were  $90.28 \pm 1.21$ ,  $99.24 \pm 0.16$ , and  $84.57 \pm 2.28$ , respectively; whereas in SUS, the values were  $74.89 \pm 2.13$ ,  $93.61 \pm 2.82$ , and  $57.71 \pm 2.14$ , respectively. Conclusion: RPA and RQA are novel nonlinear methods for BP data processing which is effective in detecting changes in cardiovascular regulatory function in conscious rats after 14 d simulated microgravity, and seem to be useful in assessing cardiovascular regulatory function in other studies.

Author

*Cardiovascular System; Blood Pressure; Gravitational Effects; Weightlessness Simulation; Rats; Microgravity*

**2008000895** Jinan Univ., Guangdong, China

**Effects of Psoralen on Improving Chemotherapeutics Drug's Concentration of HUO Cells**

Cai, Yu; Space Medicine & Medical Engineering; Vol. 19 No. 6; December 2006, pp. 391-393; In English; See also [2008000876](#)

Contract(s)/Grant(s): NSF 30-160098; LEB 2021001282; GMSF-B2005075; Copyright; Avail.: Other Sources

Objective: To determine the reversal effect of psoralen on multidrug resistance (MDR) in the harringtonine (HT)-resistant leukemic cell line HL60/HT. Method: The modulating effect of psoralen on MDR in HL60 and HL60/HT cells were determined by the measurement of cell growth and viability via M11 assay. High performance liquid chromatography (HPLC) was used to analyze intracellular HT concentrations in HL60/HT and HL60 cells treated with psoralen. Result: Psoralen from 1 to 20 micromol/L could reduce the value of IC50 to HT and enhance the accumulation of HT in HL60/HT cells. Conclusion Psoralen can reverse MDR of HL60/HT cells and is a potential modulator of MDR.

Author

*Chemotherapy; Drugs; Liquid Chromatography; Modulation; Cell Division*

**20080001033** Marine Corps for Manpower and Reserve Affairs Headquarters, Quantico, VA USA

**Operational Stress Control and Readiness (OSCAR): The USA Marine Corps Initiative to Deliver Mental Health Services to Operating Forces**

Nash, William P; Apr 1, 2006; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472703; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472703>

No abstract available

*Maintainability; Medical Services; Mental Health; Military Operations; United States*

**20080001034** Ministry of Defence, The Hague, Netherlands

**The Will to Fight - Evaluation of Dutch Morale Research during Several Missions Since 1997**

Eimers-van Nes, Rejanne; Apr 1, 2006; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472704; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472704>

No abstract available

*Leadership; Mental Performance; Morale*

**20080001143** King's Centre for Military Health Research, London, UK

**How to TRiM Away at Post Traumatic Stress Reactions: Traumatic Risk Management - Now and in the Future**

Greenbery, Neil; Langston, Vicky; Scott, Roydon; Apr 1, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472776; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Injuries; Risk*

**20080001216** Defence Research and Development Canada, Toronto, Ontario Canada

**Heat Stress Mitigation for Leopard 2C Tank Crew**

Jacobs, Ira; Michas, Robert; Limmer, Robert; Kerrigan-Brown, Debbie; McLellan, Tom; Turbide, P; May 2007; 52 pp.; In English; In English; In French; Original contains color illustrations

Report No.(s): AD-A472970; DRDC-TR-2007-082; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Directorate Armament Sustainment Programme Management (DASPM) requested Defence R&D Canada (DRDC) support with the investigation and recommendation of '...technologies available to mitigate the effects of the heat stress expected for Leopard 2C crews operating in the Kandahar region of Afghanistan in summer.' DRDC was asked to focus '...on technologies that are likely to be able to be delivered and installed by the beginning of June 2007.' Candidate heat stress mitigation strategies, technologies, technical reports, scientific reports, and commercial product specifications were reviewed in light of the timelines and engineering constraints. It was decided to test a vapour compression liquid circulating product as a 'proof of concept' that personal micro-climate cooling would significantly mitigate the anticipated heat stress challenge in theatre. In addition, a specially designed solar heat dissipation textile was fitted to the exterior of the tank. The effects of these products were evaluated by monitoring the tank temperatures, the tank crew members' body temperatures, physiological and perceptual responses to a standardized heat stress. The heat stress involved exposure of the tank and crew members in the

tank to an external air temperature of 44 C or 35 C and a simulated solar heat load of 1120 W/m<sup>2</sup> in accordance with NATO STANAG 2895 which provides guidance on meteorological conditions that should be used for testing of materiel in accordance with the location in the world where the equipment will be deployed. The crew members were exposed to the heat stress on five consecutive days, either with or without the cooling or the solar shield. The cooling system consisted of a chiller unit and a worn distribution vest (liquid cooling garment or LCG) which interfaced via thick-walled supply and return lines. It was estimated that 40-164 W of cooling reached the LCG.

DTIC

*Crews; Heat Tolerance; Tanks (Combat Vehicles)*

**20080001219** Defence Research and Development Canada, Toronto, Ontario Canada

**The Efficacy of an Air-Cooling Vest to Reduce Thermal Strain for Light Armour Vehicle Personnel**

McLellan, Tom M; Jan 2007; 34 pp.; In English; In English

Report No.(s): AD-A472976; DRDC-TR-2007-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Light armour vehicle (LAV) personnel are being subjected to high ambient temperatures and radiant heat loads for hours during recent deployments to Afghanistan. One option to reduce the heat strain of crew members is to use the existing air-conditioning discharge outlets as a source of cool air to provide microclimate cooling through an individual air-vest. In this study, seven males were exposed to either hot, dry (HD, 49 C, 10% relative humidity) or warm, humid (WH, 35 C, 70% relative humidity) conditions while either receiving (C) or not receiving (NC) cooling through an air-vest. Inlet temperatures during C were 20 C and 12 C for the HD and WH conditions, respectively, based on findings reported by Hanna (1). The air-vest was worn over a T-shirt and underneath the armour crew coveralls. Subjects also wore a fragmentation vest, helmet and gloves and sat for 3 hours during the heat-stress exposures. All subjects completed the 3 hours of heat-stress exposure during all conditions but the rise in rectal temperature approached 2 C during HD with NC. When C was provided the rise in rectal temperature was minimal throughout the heat stress. It was concluded that micro-climate conditioning was an effective way to reduce the thermal strain of LAV crew.

DTIC

*Air Cooling; Armor; Crews; Personnel; Tanks (Combat Vehicles); Vests*

**20080001224** Defence Research and Development Canada, Toronto, Ontario Canada

**Preliminary Assessment of Zopiclone (Imovane(Trademark)) use in Camp Mirage Aircrew**

Paul, Michel A; Gray, Gary W; Miller, James C; May 2006; 41 pp.; In English; In English; Original contains color illustrations  
Report No.(s): AD-A472982; DRDC-TR-2006-077; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Introduction. Based on previous work done at DRDC Toronto, the Aerospace and Undersea Medical Board drafted aeromedical policy to allow short term (maximum 5 days consecutive) flight surgeon supervised use of certain sleeping medications in aircrew during operations that are known to impact on aircrew sleep. Because of alternating day, off-circadian operations, there was a recent locally initiated change in the use of zopiclone in Camp Mirage aircrew to alternate day use throughout the 56-day rotations. DRDC Toronto was asked to evaluate this off-nominal use of zopiclone in CF aircrew. Methods. FASTTM (Fatigue Avoidance Scheduling Tool) a performance modeling program was used to predict the impact of zopiclone and to compare an alternative duty schedule (3 days of work followed by three days off) against the current schedule (cycles one 1 day of work and 1 day off) across three mission take-off times (0300 hrs, 0700 hrs, and alternating 0700 hrs & 0300 hrs). Crew duty data and sleep behaviours (reported to the attending Flight Surgeon) were used as inputs to FASTTM in order to generate 12 cognitive effectiveness models. Results. The models predict that the current schedule provides better sustained performance than a 3 days on/3 days off schedule, especially for the 0300 hrs take-off missions. The current use of zopiclone to support early circadian pre-mission sleep predicts a 4% to 6% increase in average mission cognitive effectiveness relative to no use of zopiclone. Discussion. These performance models were based on reported sleep behaviours as distinct from actigraphically measured sleep. This modelling effort, although worthwhile in the short term, should be repeated based on actigraph data in order to provide objective sleep behaviour for recalculating the performance models.

DTIC

*Drugs; Flight Crews*

**20080001226** Defence Research and Development Canada, Toronto, Ontario Canada

**The Effects of Vibration Frequencies on Physical, Perceptual and Cognitive Performance**

Nakashima, Ann; Cheung, Bob; Oct 2006; 30 pp.; In English; In English

Report No.(s): AD-A472990; DRDC-TR-2006-218; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the study of crewmember performance in land-driven vehicles, it is necessary to consider the effects of vibration on

the human body. The Advanced Vehicle Architecture for a Net enabled Combat Environment Technology Demonstrator Project (ADVANCE TDP) aims to demonstrate improved crew performance using an integrated multi-layered vectorics network, supported by an active suspension system that stabilizes the vehicle platform. This review discusses the effects of different frequencies and magnitudes of vibration on specific aspects of performance: manual control, vision, perception and cognition. The results of the numerous studies that have been done on manual tracking and visual acuity during vibration exposure have been well-documented and summarized. It has been demonstrated that vibration does not significantly affect performance on simple perceptual tasks involving auditory or visual detection of signals. Vibration has been shown to have a negative effect on complex cognitive tasks; however, vibration frequency or magnitude dependencies have not been proven.

DTIC  
*Crews; Mental Performance; Tanks (Combat Vehicles); Vibration; Vibration Effects*

**20080001227** Defence Research and Development Canada, Toronto, Ontario Canada

**A Review on the Effects of Frequency of Oscillation on Motion Sickness**

Cheung, Bob; Nakashima, Ann; Oct 2006; 29 pp.; In English

Report No.(s): AD-A472991; DRDC-TR-2006-229; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In support of the ADVANCE TDP (Advanced Vehicle Architecture for a Net-Enabled Combat Environment Technology Demonstration Project), and at the request of Director Armoured Vehicles Program Management (DAVPM), we undertook to provide a Phase I assessment on the effects of motion disturbance on the performance of operators based on a theoretical and comprehensive literature review. A comprehensive review on the effects of motion disturbance on human behaviour and well-being in all forms of transportation was completed. Based on information collected, a summary of the motion frequency and amplitude on human response was presented graphically. The main findings can be summarized as follows: The majority of information is obtained from ship-simulator or ship motion where vertical (heave) motion is the primary stimulus. Vertical motion does not correlate with the rate of carsickness. Fore-and-aft and lateral motion in the frequency range of 0.1-0.5 Hz is provocative in inducing carsickness. Postures and type of back/head rest could influence susceptibility to motion sickness. Laboratory studies indicated that the ability of the active suspension to protect against or contribute to motion sickness is influenced by whether or not the compensation is under the active control of the rider. Vertical motion frequencies below 0.5 Hz are generally more nauseogenic. Whole body vibration at 2 Hz and above can cause discomfort or injury but will not provoke motion sickness. Based on limited data, frequencies below 0.1 Hz lessen the possibility of motion sickness. The effect of vibration along the horizontal (x and y) axes on performance is unknown.

DTIC  
*Frequencies; Motion Sickness; Oscillations*

**20080001236** Defence Research and Development Canada, Toronto, Ontario Canada

**The Relationship Between Perceived Organizational and Cultural Support and Soldiers' Post-Deployment Symptoms**

Pickering, Donna L; Apr 2006; 55 pp.; In English; In English

Report No.(s): AD-A473010; DRDC-TR-2006-053; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first few months after returning home, soldiers are adjusting to being back with their family, in garrison, and in their home country. Are factors such as perceptions of a supportive organization or society able to make this transition a little easier? This research sought to address this issue by assessing the impact of perceived organizational support (i.e., unit, Canadian Forces, Canadian Government) and perceived cultural support (i.e., Canadian society) on post deployment symptomatology. Two main hypotheses were assessed in this research. The first was whether greater amounts of perceived support (both organizational and cultural) were related to lower levels of post-deployment symptoms, irrespective of the amount of stress experienced (i.e., the Main-Effect Hypothesis). The second, alternative hypothesis was that greater amounts of perceived organizational and cultural support would reduce reports of symptoms, but only at higher levels of stress (i.e., the Stress-Buffering Hypothesis). Soldiers completed a questionnaire package within two months after returning from a deployment in Bosnia. Neither the main effect, nor the stress-buffering effect was supported. However, greater amounts of perceived work stress and combat stress were associated with the experience of higher levels of post-deployment symptoms in this sample.

DTIC  
*Deployment; Military Personnel; Signs and Symptoms*

**20080001614** NASA Johnson Space Center, Houston, TX, USA

**Evaluation of the Hard Upper Torso Shoulder Harness**

DeWitt, John; Jones, Jeffrey; November 2007; 62 pp.; In English; Original contains color and black and white illustrations  
Report No.(s): NASA/TP-2007-214753; S-1003; Copyright; Avail.: CASI: [A04](#), Hardcopy

To determine how the use of a shoulder harness during Extravehicular Activity (EVA) training activities subjectively and objectively affects the likelihood of shoulder discomfort and injury by assessment of shoulder motion and subject comfort during task performance. Data were collected during two separate phases. In phase 1, video and verbal data were collected from subjects during inverted operations at the Neutral Buoyancy Laboratory (NBL). Discomfort ratings were collected during shoulder maneuvers, and comments were recorded regarding subjective evaluations before, during, and after movements. In phase 2, sensors measured the load distribution and average pressure on the shoulders during simulated inversion in the laboratory. A force equal to the subjects body weight was placed on each subjects shoulders, and pressures were recorded during shoulder motions. During actual inversion in the NBL, subjects reported lower pain ratings while using the harness than without the harness. Subjects reported a sense of decreased shoulder range of motion while using the harness, although video records do not suggest that range of motion was affected. In general, subjects reported that the decreased sense of range of motion was the cost for the increased comfort. With both harness and no harness conditions, however, the reports of pain and discomfort were evident, suggesting that the harness may reduce discomfort, but not eliminate it.

Author

*Harnesses; Shoulders; Torso; Extravehicular Activity; Neutral Buoyancy Simulation*

**20080001615** NASA Johnson Space Center, Houston, TX, USA

**NASA-Developed ProE-Based Tool for the Ray-Tracing of Spacecraft Geometry to Determine Radiation Doses and Particle Fluxes in Habitable Areas of Spacecraft and in the Human Body**

Ponomarev, Artem L.; Nounu, Hatem N.; Hussein, Hesham F.; Kim, Myung-Hee Y.; Atwell, William; Cucinotta, Francis A.; November 2007; 42 pp.; In English; Original contains color and black and white illustrations  
Report No.(s): NASA/TP-2007-214770; S-1021; Copyright; Avail.: CASI: [A03](#), Hardcopy

The ray-tracing technique is a powerful scientific tool that enables the analysis of radiation shielding properties of a spacecraft based on a geometry model. We discuss a method to describe spacecraft geometry as defined by one of the modern computer-aided drafting tools, ProE. A suite of software tools, called Fishbowl, is presented to convert the spacecraft geometric data to the areal density map, which is used for space radiation shielding analysis in the habitable area of the spacecraft. This tool allows users to create elaborate models of spacecraft. The areal density map is given as a function of the ray position originating from a given point inside a spacecraft or human body. The map is then input to the high-charge-and-energy transport computer program (HZETRN) code developed at NASA. The HZETRN code calculates energy spectra of high-energy particles passing through the spacecraft material of a certain thickness and takes into account fragments created by nuclear reactions. The flux at a dose point can be determined with this tool, as well as a false color ball displaying hot and cold spots of radiation penetrating the spacecraft wall, which can be useful for suggesting more efficient spacecraft geometries for radiation shielding. In other words, the directionality of the received radiation is described for the analysis of the spacecraft design to make it more optimal for radiation protection. Two examples of the validation of the ProE-based model with a simpler OpenGL/C++ in-house tool are presented. Several dose rate data are presented at points within the Lunar Transfer Vehicle and within the astronaut s body received from space radiation. A human phantom model constructed from several parts was introduced in ProE too. Examples of radiation shielding calculations for lunar mission are described.

Author

*Spacecraft Shielding; Ray Tracing; Radiation Shielding; Descriptive Geometry; Computer Programs; Extraterrestrial Radiation; Radiation Measurement*

**20080001684** Army Research Lab., Aberdeen Proving Ground, MD USA

**Neuro-Cognitive Assessment, Symptoms of Attention Deficit and Hyperactivity Disorder, and Soldier Performance during 68W Advanced Individual Training**

Rice, Valerie J; Marra, Diane; Butler, Jenny; Oct 2007; 47 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473172; ARL-TR-4292; No Copyright; Avail.: Defense Technical Information Center (DTIC)  
ONLINE: <http://hdl.handle.net/100.2/ADA473172>

This study is one in a series of studies examining factors that impact Soldier performance during Advanced Initial Training (AIT). This study examines the relationships between a) Soldier performance using the Interactive Metronome1 (IM), a new interactive computer technology used to assess neuro-cognitive function in terms of auditory and visual input with

psychomotor timing and rhythm output, b) symptoms of attention deficit and hyperactivity disorder (SoAD/HD), and c) academic and physical performance during military occupational specialty 68W AIT. Pearson product correlations and backward stepwise regressions were used to analyze the data. Participants included 122 Soldiers attending 68W AIT. Results revealed a negative correlation between SoAD/HD and grade point average (GPA) ( $p = 0.03$ ). Results also revealed correlations between overall ( $p = 0.03$ ) and inattentive type ( $p = 0.00$ ) SoAD/HD and IM performance without auditory cues hypoanticipatory scores (the individual is late in his response) ( $p < 0.05$ ). In addition, the IM assessment with auditory cues was predictive of AIT performance including GPA and all components of the Army Physical Fitness Test and of both the total number of new musculoskeletal injury (MSI) profiles and total profile days for MSIs. Although the R-square was small in each case ( $R^2 \leq 0.13$ ), these results demonstrate relationships between neuro-cognitive performance as measured by the IM, SoAD/HD, and physical and cognitive performance during AIT. Additional research is recommended on SoAD/HD among Soldiers, training with the IM to reduce attrition and improve cognitive performance among Soldiers at risk for reduced performance during AIT, and the use of IM training to improve physical performance and reduce MSI injuries.

DTIC

*Cognition; Education; Psychomotor Performance; Signs and Symptoms*

**20080001904** Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA

### **Experimental Starvation in Man**

Keys, Ancel; Brozek, Josef; Henschel, Austin; Mickelsen, Olaf; Taylor, Henry L; Simonson, Ernst; Wells, Samuel; Oct 15, 1945; 49 pp.; In English

Report No.(s): AD-A473351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effects on man of starvation such as occurs in war and in periods of famine, are very imperfectly known in general and are almost unexplored in terms of quantitative and functional details. Various groups working in liberated Europe are currently collecting valuable information but their findings are not yet reported and, in any case, will be rather limited because of field conditions.

DTIC

*Food Intake; Nutrition*

**20080001961** Naval Research Advisory Committee, Arlington, VA USA

### **Aviator Physical Stress**

Jul 1990; 78 pp.; In English

Report No.(s): AD-A473473; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effect of physical stress on the tactical aviator and its impact on mission performance was examined. The physical stresses identified, all consequences of rapid-onset or sustained acceleration during flight, include G-induced Loss of Consciousness (G-LOC), Spatial Disorientation (SD), and neck injury. Though SD as a predominate cause of controlled flight into the terrain has been known for many years, widespread reporting of G-LOC and cervical injury has only occurred during the past decade, coincident with the introduction of high performance, agile aircraft (F-16, F-18). The Naval Medical Research and Development Command (NMRDC) requested that the Naval Research Advisory Committee (NRAC) convene a panel to study these problems. Emerging Tactical Aviation (TACAIR) technology will increase the adverse effects of Aviator Physical Stress (APS). The next generation of aircraft will be highly maneuverable and capable of sustaining high-G levels without severe energy tradeoffs. Additionally, the extra weight attributed to helmet-mounted video display systems, night vision aids and laser protective devices will increase the hazard of neck injury in flight. The study begins with a discussion of the historical perspective, changing operational environment, and the impact of emerging technology on APS.

DTIC

*Aircraft Pilots; Pilots*

## 54

### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

**20080000344** NASA Johnson Space Center, Houston, TX, USA

### **Biomedical Support of U.S. Extravehicular Activity**

Gernhardt, Michael L.; Dervay, J. P.; Gillis, D.; McMann, H. J.; Thomas, K. S.; [2007]; 14 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

The world's first extravehicular activity (EVA) was performed by A. A. Leonov on March 18, 1965 during the Russian

Voskhod-2 mission. The first US EVA was executed by Gemini IV astronaut Ed White on June 3, 1965, with an umbilical tether that included communications and an oxygen supply. A hand-held maneuvering unit (HHMU) also was used to test maneuverability during the brief EVA; however the somewhat stiff umbilical limited controlled movement. That constraint, plus difficulty returning through the vehicle hatch, highlighted the need for increased thermal control and improved EVA ergonomics. Clearly, requirements for a useful EVA were interrelated with the vehicle design. The early Gemini EVAs generated requirements for suits providing micro-meteor protection, adequate visual field and eye protection from solar visual and infrared radiation, gloves optimized for dexterity while pressurized, and thermal systems capable of protecting the astronaut while rejecting metabolic heat during high workloads. Subsequent Gemini EVAs built upon this early experience and included development of a portable environmental control and life support systems (ECLSS) and an astronaut maneuvering unit. The ECLSS provided a pressure vessel and controller with functional control over suit pressure, oxygen flow, carbon dioxide removal, humidity, and temperature control. Gemini EVA experience also identified the usefulness of underwater neutral buoyancy and altitude chamber task training, and the importance of developing reliable task timelines. Improved thermal management and carbon dioxide control also were required for high workload tasks. With the Apollo project, EVA activity was primarily on the lunar surface; and suit durability, integrated liquid cooling garments, and low suit operating pressures (3.75 pounds per square inch absolute [psia] or 25.8 kilopascal [kPa],) were required to facilitate longer EVAs with ambulation and significant physical workloads with average metabolic rates of 1000 BTU/hr and peaks of up to 2200 BTU/hr. Mobility was further augmented with the Lunar Roving Vehicle. The Apollo extravehicular mobility unit (EMU) was made up of over 15 components, ranging from a biomedical belt for capturing and transmitting biomedical data, urine and fecal containment systems, a liquid cooling garment, communications cap, a modular portable life support system (PLSS), a boot system, thermal overgloves, and a bubble helmet with eye protection. Apollo lunar astronauts performed successful EVAs on the lunar surface from a 5 psia (34.4 kPa) 100% oxygen environment in the Lunar Lander. A maximum of three EVAs were performed on any mission. For Skylab a modified A7LB suit, used for Apollo 15, was selected. The Skylab astronaut life support assembly (ALSA) provided umbilical support through the life support umbilical (LSU) and used open loop oxygen flow, rather than closed-loop as in Apollo missions. Thermal control was provided by liquid water circulated by spacecraft pumps and electrical power also was provided from the spacecraft via the umbilical. The cabin atmosphere of 5 psia (34.4 kPa), 70% oxygen, provided a normoxic atmosphere and because of the very low nitrogen partial pressures, no special protocols were required to protect against decompression sickness (DCS) as was the case with the Apollo spacecraft with a 5 psi, 100% oxygen environment.

Derived from text

*Environmental Control; Extravehicular Activity; Extravehicular Mobility Units; Human Factors Engineering; Life Support Systems; Oxygen; Temperature Control; Bioastronautics; Aerospace Environments*

**2008000557** General Engineering and Systems Analysis Co., Inc., Boonsboro, MD USA

**Development and Validation of ATB Model for THOR-NT Dummy**

Shams, Tariq; Cheng, Huaining; May 2007; 89 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-04-D-6472; Proj-7184

Report No.(s): AD-A472315; No Copyright; Avail.: Defense Technical Information Center (DTIC)

THOR-NT is the National Highway Traffic Safety Administration's (NHTSA) Advanced Frontal Impact Dummy. GESAC, Inc., in cooperation with NHTSA and Air Force Research Laboratory (AFRL), has developed the Articulated Total Body (ATB) model for the THOR-NT dummy. ATB is a rigid-body dynamics simulation program. The ATB THOR-NT model consists of 21 segments coupled by 20 joints. Segment mass properties, joint mechanical properties, and surface contact properties were modeled from test data collected through quasi-static and dynamic tests. A set of ATB simulations were developed for the THOR-NT certification tests. The results were compared and analyzed. The simulations reproduced the test responses reasonably well. This work demonstrated that ATB model can serve as an effective preliminary assessment tool for studies involving THOR-NT dummy.

DTIC

*Models*

**2008000642** General Dynamics Advanced Information Systems, Dayton, OH USA

**A Methodology for Evaluating Advanced Operator Workstation Accommodation**

Hudson, Jeffrey A; Zehner, Gregory F; Parakkat, Julia; Choi, Hyeg J; Nov 2006; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2830

Report No.(s): AD-A472518; No Copyright; Avail.: Defense Technical Information Center (DTIC)

While the Human Systems Engineering (HSE) process is wide and varied during system development, part of it must seek

to maximize mission effectiveness through experimentation and analysis in two areas: 1) physical layout - to ensure the widest physical accommodation range of operator body size and proportion, 2) reduction of performance reducing fatigue. This white paper outlines a methodological approach that should be used to optimize and evaluate the physical and functional aspects of candidate designs for future Advanced Operator Workstations (AOWs).

DTIC

*Human Factors Engineering; Workstations*

**2008000781** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Living Together in Space: The International Space Station Internal Active Thermal Control System Issues and Solutions-Sustaining Engineering Activities at the Marshall Space Flight Center From 1998 to 2005**

Wieland, P. O.; Roman, M. C.; Miller, L.; June 2007; 278 pp.; In English

Report No.(s): NASA/TM-2007-214964; M-1193; Copyright; Avail.: CASI: [A13](#), Hardcopy

On board the International Space Station, heat generated by the crew and equipment is removed by the internal active thermal control system to maintain a comfortable working environment and prevent equipment overheating. Test facilities simulating the internal active thermal control system (IATCS) were constructed at the Marshall Space Flight Center as part of the sustaining engineering activities to address concerns related to operational issues, equipment capability, and reliability. A full-scale functional simulator of the Destiny lab module IATCS was constructed and activated prior to launch of Destiny in 2001. This facility simulates the flow and thermal characteristics of the flight system and has a similar control interface. A subscale simulator was built, and activated in 2000, with special attention to materials and proportions of wetted surfaces to address issues related to changes in fluid chemistry, material corrosion, and microbial activity. The flight issues that have arisen and the tests performed using the simulator facilities are discussed in detail. In addition, other test facilities at the MSFC have been used to perform specific tests related to IATCS issues. Future testing is discussed as well as potential modifications to the simulators to enhance their utility.

Author

*International Space Station; Temperature Control; Destiny Laboratory Module; Active Control; Spacecraft Cabin Simulators; Test Facilities; Air Conditioning Equipment*

**2008000811** Army Natick Soldier Center, Natick, MA USA

**Law Enforcement Advanced Protection (LEAP) Requirements Focus Group Report**

DiChiara, Adam; Addonizio, Mary; Sep 21, 2007; 70 pp.; In English

Contract(s)/Grant(s): Proj-LEAP-CB-SAP

Report No.(s): AD-A472472; NATICK/TR-07/021; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This focus group report documents the findings of a Law Enforcement Advanced Protection (LEAP) Requirements User Focus Group on November 15-16, 2006 in Alexandria, Virginia. This focus group is one in a series of personal protective equipment (PPE) related user focus groups for members of the law enforcement community. Its purpose was primarily to collect data/criteria for operational requirements, PPE trends and concepts of operations (CONOPS) from representatives within the law enforcement community. Program participants represented a cross section of the country's law enforcement community, covering different agencies, departments, and job functions. Focus group topics included: the current state of PPE for law enforcement; PPE integration and compatibility concerns; chemical/biological (CB) PPE and systems; CB response mission roles and mission related tasks; and law enforcement duty uniforms standards related issues. Data collected through this focus group, coupled with on-going research and analysis will be used in a number of LEAP related activities, including the development of performance criteria for law enforcement specific PPE standards.

DTIC

*Biological Weapons; Chemical Warfare; Law (Jurisprudence); Protection; Protective Clothing; Protectors*

**2008001049** Army Research Lab., Aberdeen Proving Ground, MD USA

**A Human Factors Engineering Assessment of the Buffalo Mine Protection Clearance Vehicle Roof Hatch**

Animashaun, Assist F; Oct 2007; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-665326A33B

Report No.(s): AD-A472736; ARL-TR-4272; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472736>

The project was initiated at the request of two platoons of Combat Engineers, military occupational specialty 21B, who serve as part of the Kansas National Guard. The U.S. Army Research Laboratory's (ARL's) Human Research and Engineering



Directorate performed an evaluation of the emergency egress characteristics of the Buffalo. ARL developed a plan to evaluate the emergency egress characteristics of the Buffalo using human figure modeling. A detailed analysis of the vehicle roof hatch was performed to identify whether the larger end of the male Soldier population, with equipment and clothing, could fit through the hatch. The results of the egress modeling identified some shortcomings with the emergency egress characteristics of the Buffalo and two recommendations were made: (1) increase the hatch size to 69 cm by 50 cm or (2) use a circular hatch with a diameter measuring 61 cm instead of a rectangular or square hatch. The results and recommendations from the modeling were used to help drive design modifications that, if implemented, could enhance the emergency egress characteristics of the Buffalo.

DTIC

*Clearances; Hatches; Human Factors Engineering; Protection; Roofs*

**20080001213** CORD Group Ltd., Dartmouth, Nova Scotia Canada

**Manikin Testing on LASA Suit**

Durnford, W; Potter, P; Mar 16, 2006; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472964; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As part of a BL2 with the Directorate of Aerospace Engineering Support DAES, DRDC Toronto required testing to be conducted on a thermal immersion manikin to evaluate the thermal resistance of the NBC immersion suit LASA in a wave pool. Parallel to the manikin testing, human testing was performed using the same test facilities. In conjunction with this evaluation, the thermal resistance of the ACE extreme cold weather garments and the modified current flyer's coverall immersion suit was also measured. This report details the thermal resistance results of the ACE extreme cold weather garments, LASA immersion suit, and modified current flyer's coverall immersion suit in still air and 40 cm waves. These results will be compared to values recorded from human subjects using the same wave height tested at the same test facility (wave tank).

DTIC

*Evaluation; Exposure; Insulation; Submerging; System Effectiveness; Thermal Resistance*

**20080001261** CMC Electronics, Inc., Ottawa, Ontario Canada

**Functional Modelling, Scenario Development, and Options Analysis to Support Optimized Crewing for Damage Control. Phase 1: Functional Modelling**

Torenvliet, Gerard; Jamieson, Greg; Cournoyer, Luc; May 18, 2006; 94 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7711-05-7972/A

Report No.(s): AD-A473053; CMC-1000-1370; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Canadian Navy hopes to achieve significant lifetime cost reductions by implementing optimized crew levels across its next-generation fleet. Defence Research and Development Canada (DRDC) has recognized that optimized crewing can only be achieved through a thorough Human-Systems Integration (HSI) effort, and that this effort will require systems modelling techniques to help the Navy predict the effectiveness of technologies and work strategies that aim to reduce operator workload and improve mission success. This report describes the first phase of a project undertaken to provide DRDC with such a technique, and details the development of an Abstraction Hierarchy (AH) functional model of the domain of damage control. Two subsequent phases of analysis are planned: to develop damage control scenarios, and to identify emerging damage control technologies and the reduced crew levels required to support them. These will be used as inputs for a follow-on project to develop a simulation of human and automated work in the damage control domain. The AH model documented in this report is a strong basis for the subsequent phases of this project, and the follow-on simulation development effort.

DTIC

*Crews; Damage; Models*

**20080001445** NASA Glenn Research Center, Cleveland, OH, USA; NASA Langley Research Center, Hampton, VA, USA

**Halophytes Energy Feedstocks: Back to Our Roots**

Hendricks, Robert C.; Bushnell, Dennis M.; [2007]; 11 pp.; In English; Original contains color and black and white illustrations

Report No.(s): ISROMAC12-2008-20241; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001445>

Of the Earth's landmass, approx.43% is arid or semi-arid, and 97% of the Earth's water is seawater. Halophytes are salt-tolerant plants (micro and macro) that can prosper in seawater or brackish waters and are common feedstocks for fuel and

food (fuel-food feedstocks) in depressed countries. Two types, broadly classed as coastal and desert, can be found in marshes, coastal planes, inland lakes, and deserts. Major arid or semi-arid halophyte agriculture problems include pumping and draining the required high volumes of irrigation water from sea or ocean sources. Also, not all arid or semi-arid lands are suitable for crops. Benefits of halophyte agriculture include freeing up arable land and freshwater resources, cleansing the environment, decontaminating soils, desalinating brackish waters, and carbon sequestration. Sea and ocean halophyte agriculture problems include storms, transport, and diffuse harvesting. Benefits include available nutrients, ample water, and Sun. Careful attention to details and use of saline agriculture fuel feedstocks are required to prevent anthropogenic disasters. It is shown that the potential for fuel-food feedstock halophyte production is high; based on test plot data, it could supply 421.4 Quad, or 94% of the 2004 world energy consumption and sequester carbon, with major impact on the Triangle of Conflicts.

Author

*Water Resources; Sea Water; Arid Lands; Irrigation; Marshlands; Drainage; Agriculture*

**20080001859** Research Inst. for Communication, Information Processing and Ergonomics, Wachtberg-Werthhoven, Germany

**Applicability of Virtual Environments as C4ISR Displays**

Alexander, Thomas; Renkewitz, Helge; Conradi, Jessica; Jun 2006; 28 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Decision Support Systems; Display Devices; Situational Awareness*

**20080001862** University of Central Florida, Orlando, FL USA

**Human Performance Assessments when Using Augmented Reality for Navigation**

Goldiez, Brian F; Saptoka, Nabin; Aedunuthula, Prashanth; Jun 2006; 32 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473301; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Human Performance; Navigation; Rescue Operations*

**20080001870** Army Simulation Training, and Instrumentation Command, Orlando, FL USA

**The Direction of Virtual Vehicle Simulations for Military Training**

Riggins, David W; Jun 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473314; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Simulation; Virtual Reality*

**20080002131** Army Combined Arms Combat Developments Activity Fort Leavenworth, KS, USA

**A Vision for Future Virtual Training**

Shufelt, Jr, James W; Jun 15, 2006; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473302; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Training Devices; Virtual Reality*

**20080002277** NASA Glenn Research Center, Cleveland, OH, USA

**Solid-State Personal Dosimetry**

Wrbanek, John D.; Fralick, Gustave C.; Wrbanek, Susan Y.; July 26, 2005; 4 pp.; In English; Radiation and Micrometeoroid Mitigation Technology Focus Group, 26-27 Jul. 2005, Hampton, VA, USA

Contract(s)/Grant(s): WBS 22-101-42-20; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002277>

This document is a web site page, and a data sheet about Personal protection (i.e., space suits) presented to the Radiation and Micrometeoroid Mitigation Technology Focus Group meeting. The website describes the work of the PI to improve solid state personal radiation dosimetry. The data sheet presents work on the active personal radiation detection system that is to provide real-time local radiation exposure information during EVA. Should undue exposure occur, knowledge of the dynamic

intensity conditions during the exposure will allow more precise diagnostic assessment of the potential health risk to the exposed individual.

CASI

*Dosimeters; Radiation Dosage; Solid State; Space Suits; Websites; Radiation Measurement*

**20080002340** Jacobs Sverdrup Technology, Inc., Houston, TX, USA

**Process for Selecting System Level Assessments for Human System Technologies**

Watts, James; Park, John; July 17, 2006; 7 pp.; In English; 36th International Conference on Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNJ05H105C; Copyright; Avail.: CASI: [A02](#), Hardcopy

The integration of many life support systems necessary to construct a stable habitat is difficult. The correct identification of the appropriate technologies and corresponding interfaces is an exhaustive process. Once technologies are selected secondary issues such as mechanical and electrical interfaces must be addressed. The required analytical and testing work must be approached in a piecewise fashion to achieve timely results. A repeatable process has been developed to identify and prioritize system level assessments and testing needs. This Assessment Selection Process has been defined to assess cross cutting integration issues on topics at the system or component levels. Assessments are used to identify risks, encourage future actions to mitigate risks, or spur further studies.

Author

*Life Support Systems; Systems Integration; Technology Assessment; Human Factors Engineering*

**20080002596** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

**Resultaten van de Zitcomfortproef in de Boxer Command Post van Mei 2007 (Results of a Seat Comfort Test on the Command Post Version of the Boxer held May 2007)**

Oudenhuijzen, A K; Sep 2007; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473758; TNO-DV-2007-A393; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A prototype of the Command Post version of the Boxer, an armored vehicle for the Royal Netherlands Army was tested in May 2007. The test focuses on seat comfort and crew accommodation for certain seats in the vehicle. Earlier tests showed insufficient comfort and available space for the vehicle crew. Following these tests, improvements were made. The latest tests showed that the comfort level as well as the available space in the vehicle is sufficient for the seats tested.

DTIC

*Comfort; Human Factors Engineering; Military Vehicles; Seats*

**20080002617** Army Research Inst. of Environmental Medicine, Natick, MA USA

**Acceptability of a Wearable Vital Sign Detection System**

Tharion, William J; Buller, Mark J; Karis, Anthony J; Mullen, Stephen P; Jan 2007; 6 pp.; In English

Report No.(s): AD-A473790; P07-59; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study assessed the human factors issues associated with wearing a Vital Sign Detection System (VSIDS), a body worn physiological monitoring system. Experienced combat Soldiers (n = 27) participated in a combat training exercise of ~ 120 hr while wearing the VSIDS. They were then given a questionnaire to assess comfort, physical impact on the body, and acceptability of the VSIDS as well as questions on fit, impact on performance, and durability of the VSIDS. Comfort was impacted the most by the VSIDS when in the prone position, possibly affecting sleep, and prone position rifle shooting. Skin irritation or discomfort was reported in 85% of respondents. Sixty-two percent thought the VSIDS was not acceptable to wear for > 8 hr. Yet, at the same time, 92% of Soldiers approved of the concept for health monitoring, and 89% said they would wear the VSIDS as is if it could help save their life. The VSIDS needs to be modified to be more comfortable before it can be fielded for medical monitoring of Soldiers in the field.

DTIC

*Acceptability; Comfort; Detection; Human Factors Engineering; Military Personnel; Symbols*

## MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

**20080000347** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

### Some Algorithms for Polygons on a Sphere

Chamberlain, Robert G.; Duquette, William H.; June 2007; 33 pp.; In English; Association of American Geographers Annual Meeting, 17-21 Apr. 2007, San Francisco, CA, USA

Contract(s)/Grant(s): NAS7-03001; 101435.03.25.06

Report No.(s): JPL-Publ-07-03; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000347>; <http://hdl.handle.net/2014/40409>

A limited search for polygon algorithms for use in a new military training simulation that interfaces with several others produced only planar algorithms. To avoid having to implement several different sophisticated map projections to guarantee compatibility with all the other simulations, we opted to develop algorithms that work directly on a sphere. The first is an algorithm to compute the area of a polygon whose edges are segments of great circles. Since our model represents certain object locations as mathematical points, the second topic is whether a specified point is inside a specified polygon. Possibly pathological cases are identified and eliminated. When we realized that most political boundaries are actually rhumb lines, use of the Mercator projection equations seemed unavoidable. We then reasoned that if all the edges were short enough, lat-lon lines, great circle segments, and rhumb lines would be close enough to being identical that we could use whichever was most convenient. Thence, we looked at the relationship between the maximum distances between great circle segments and rhumb lines and between lat-lon lines and rhumb lines as functions of length, azimuth, and latitude. The final algorithm finds the area overlapped by two polygons. Again, potentially pathological cases are identified and eliminated.

Author

*Algorithms; Azimuth; Great Circles; Maps*

**20080000746** NASA Goddard Space Flight Center, Greenbelt, MD, USA

### The 'Biologically-Inspired Computing' Column

Hinchey, Mike; [2007]; 11 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Self-managing systems, whether viewed from the perspective of Autonomic Computing, or from that of another initiative, offers a holistic vision for the development and evolution of biologically-inspired computer-based systems. It aims to bring new levels of automation and dependability to systems, while simultaneously hiding their complexity and reducing costs. A case can certainly be made that all computer-based systems should exhibit autonomic properties [6], and we envisage greater interest in, and uptake of, autonomic principles in future system development.

Derived from text

*Computer Techniques; Autonomic Nervous System; Automatic Control*

**20080000933** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

### Development of a Virtual Keyboard Based on Button Tracking Using Magnetic Induction

Sun, Herman; Fahn, Chin-Shyung; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 311-322; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

In this paper, we present the development of a virtual keyboard based on button tracking, which consists of fingertip sensors, keyboard panels, keyboard layouts, and a control unit. The fingertip sensor is composed of a small generator coil attached on the fingertip and two sensor coils installed on the keyboard panel. This keyboard panel functions as sensor amplifiers, generator coil drivers, and as a hand coaster while a user is typing. The keyboard layout which is only a picture describing the arrangement of keys on the keyboard is used for guiding the user during the training, and the control unit is used for coordinating the keyboard system and transmitting sensors' data to the host computer. The theoretical formulation of the fingertip sensor and the realization of the virtual keyboard are also presented. To prevent interference among the generator coils, we adopt a time division method to scan the generator and sensor coils. To obtain high flexibility in the system, training and recognition methods for identifying the keyboard keys are also proposed. At the training stage, a simple and robust vector-quantization-based training algorithm is developed, so that trained models of an acceptable quality can be obtained even though 25% of outliers exist in the training data. At the recognition stage, an efficient recognition algorithm based on distance measurement is also presented. Additionally, in online typing, we propose a visual feedback technique to display the

corresponding keys pressed by the fingers. So far, the experimental results of the virtual keyboard as well as both the training and recognition algorithms are very satisfactory. Results reveal that our virtual keyboard is currently usable for a man-machine interface.

Author

*Keying; Human-Computer Interface; Virtual Reality*

**20080000939** Feng Chia Univ., Taichung, Taiwan, Province of China

**A Dual-Purpose Signature for Authentication on UMTS**

Yeh, Chang-Kuo; Lee, Wei-Bin; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 343-347; In English; See also [20080000927](#); Copyright; Avail.: Other Sources

In UMTS, the mobile station and the authentication server can perform mutual authentication via the secret shared key. This implies that the server requires a secure storage to maintain the shared keys of all users. Clearly this large, sensitive storage increases both maintenance loading and security concerns: re malicious intruders. As this paper shows, the signature technique can be applied not only to discard the bulky storage needed at the server but also to guarantee the access rights of the mobile clients. Two different important purposes can be simultaneously achieved from the same signature equation, so the Dual-Purpose signature provides valuable improvements to UMTS.

Author

*Computer Information Security; Telecommunication; Mobile Communication Systems; Signatures; Intrusion Detection (Computers)*

**20080012251** Rockwell International Corp., El Segundo, CA USA

**Uniform rotating field network structure to efficiently package a magnetic bubble domain memory**

Wolfshagen, Ronald G., Inventor; Ypma, John E., Inventor; Murray, Glen W., Inventor; Chen, Thomas T., Inventor; August 8, 1978; 10 pp.; In English

Contract(s)/Grant(s): NAS1-12435

Patent Info.: Filed March 16, 1976; US-PATENT-4,106,106; US-PATENT-APPL-SN-667338; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012251>

A unique and compact open coil rotating magnetic field network structure to efficiently package an array of bubble domain devices is disclosed. The field network has a configuration which effectively enables selected bubble domain devices from the array to be driven in a vertical magnetic field and in an independent and uniform horizontal rotating magnetic field. The field network is suitably adapted to minimize undesirable inductance effects, improve capabilities of heat dissipation, and facilitate repair or replacement of a bubble device.

Official Gazette of the U.S. Patent and Trademark Office

*Bubble Memory Devices; Magnetic Field Configurations; Magnetic Storage; Rotation*

**20080012255** Rockwell International Corp., El Segundo, CA USA

**Bias structure to efficiently package a magnetic bubble domain device**

Chen, Thomas T., Inventor; May 23, 1978; 4 pp.; In English

Contract(s)/Grant(s): NAS1-12435

Patent Info.: Filed October 27, 1976; US-PATENT-4,091,362; US-PATENT-APPL-SN-736037; No Copyright; Avail.:

CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012255>

A single, compact bias structure to efficiently package a plurality of magnetic bubble domain device chips having different bias requirements. The vertical magnetic field distribution within the bias structure air gap is selectively controlled by a magnetically soft field adjusting assembly suitably attached within the bias structure. The size and configuration of the field adjusting assembly tailors local field variations within the air gap to correspond with the bias requirements of the bubble domain chips disposed therein.

Official Gazette of the U.S. Patent and Trademark Office

*Bias; Bubble Memory Devices; Chips; Magnetic Domains*

## COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 *Electronics and Electrical Engineering*. For computer vision see 63 *Cybernetics, Artificial Intelligence and Robotics*.

**2008000942** National Taipei Univ. of Technology, Taipei, Taiwan, Province of China

### **Studying an Approach Solution of I/O Buffer Information Specification (IBIS) Model**

Huang, Wen-Tzeng; Chou, Ching-Tung; Lin, In-Shiuh; Chen, Chin-Hsing; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 353-359; In English; See also [2008000927](#); Copyright; Avail.: Other Sources

Modern electronic products must possess high speed, light weight, low power consumption, and small physical size. Signal Integrity (SI) is a significant technology for designing high-speed printed circuit boards (PCB), known as HS-PCB. In SI analysis of HS-PCB, its interconnection and the I/O Buffer Information Specification (IBIS) model are two major components to be simulated. Generally, an IBIS model can be obtained from the IC design house, constructed by measuring the necessary information, or converting from the Pspice model. This paper presents a methodology for constructing an IBIS model. Our proposed model can fit the strict requirements of its IC datasheet. We created the buffer model using Pspice tools, entered the necessary parameters into this buffer model, converted it into various assignment models, and then simulated all assignment pins. The error rate between our proposed model and its datasheet is within 1%. Our method can be applied to SI simulation.

Author

*Circuit Boards; Printed Circuits; Buffer Storage; Computer Aided Design*

**2008000953** Air Force Research Lab., Hanscom AFB, MA USA

### **Current Capabilities of Digital Beamforming**

Curtis, David D; Spendley, Daniel N; Luu, Danh Q; Sep 2007; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4916

Report No.(s): AD-A472531; AFRL-SN-HS-TP-2007-0011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472531>

This paper surveys the current state of the art of digital beamforming (DBF) with an emphasis on current capabilities and practical implementation techniques. Digital control of phased arrays in both receive and transmit modes will be covered, including such key issues as hardware, integration, processing load, and cost. The viability of future trends in DBF will be examined in terms of feasibility and cost of the enabling technologies of adaptive hardware and embedded software.

DTIC

*Beamforming; Digital Systems*

**20080001866** Cairo Univ., Giza, Egypt

### **Control of Rotor Vibrations Using Hybrid Squeeze Film Dampers**

El-Shafei, A; Massoud, A T; El-Hakim, M; Hatbout, J P; Youssef, R; Nov 1997; 267 pp.; In English

Contract(s)/Grant(s): F49620-92-J-0512

Report No.(s): AD-A473307; MDP-EOARD-1/97; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report covers the development of the Hybrid Squeeze Film Damper (HSFD) for use as an active control device for controlling rotor vibrations. In particular, the work done included the automation and design of the HSFD, the elaborate modeling of the HSFD, the development of the control algorithms, and finally the experimental verification of the performance and control of the HSFD. This extensive research project confirmed the capabilities of the HSFD as an efficient and powerful controlling element for high speed rotors, particularly of aircraft engines and rocket turbopumps?. Specifically, the results of this research project establish that the HSFD: 1) improves% the vibration isolation capability of the rotor support, 2) reduces the amplitude of vibration of the rotor at all speeds, and 3) results in a rotating machine that is capable of operating under varying and adverse conditions. It is the opinion of the research team that the HSFD is now ready for engine testing. The device is reliable, the control algorithms are sufficiently developed, the laboratory experimentation and verification were extensive and illustrate the strengths and adaptability of HSFDs. It is thus appropriate to expect that this work should lead to full-scale engine testing of the active control of rotor vibrations using HSFDs.

DTIC

*Aircraft Engines; Rotors; Squeeze Films; Vibration; Vibration Isolators*

**20080002151** Army Research Development and Engineering Command, Warren, MI USA

**HPC Access Using 'KVM over IP'**

Kedziorek, Dan; Czerniak, Gregory P; Jun 8, 2007; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473221; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473221>

A persistent challenge in the High-Performance Computing (HPC) community is how to provide remote visualization capability to its users. A dynamic and economical solution is a KVM-over-IP technology, which uses a pre-existing TCP/IP network to transmit KVM data between two locations. However, the level of performance and functionality present in the current consumer-level KVM-over-IP devices makes them less than desirable for DoD HPC applications. To address the specific needs of the DoD HPC community, the RDECOM-TARDEC HPC Group undertook a 3-year development effort through the pursuit of an Army-funded Phase-II Small Business Innovation Research (SBIR) effort with IP Video Systems to produce a version of their V2D product with advanced features. To accommodate remote use of the high-end visualization capabilities of a DoD HPC facility, many advanced features are necessary. TARDEC-HPC's SBIR with IP Video Systems indicated specific requirements for creating a KVM-over-IP device that could be used for HPC visualization purposes. These requirements included support for USB keyboard and mouse, multi-channel digital audio, full-duplex RS232 transmissions, and receiver-side graphic genlock support. This paper discusses the setup, results, and challenges associated with a remote KVM over IP usage by testing the prototype V2D hardware. These field tests were performed between two locations on separate networks connected only via the Internet. As a result of this SBIR effort to help increase the capabilities of IP Video System's V2D product, providing remote visualization access to DoD HPC Centers via KVM over IP technology is not only possible, but very usable even with modest bandwidth availability. The use of this technology can provide engineers and scientists direct access to graphical super computing capabilities and resources while minimizing lengthy and redundant data transfer times, costly licenses, and the inconvenience of travel.

DTIC

*Computer Graphics; Control; Data Transmission; Protocol (Computers); Remote Control; Switching Circuits*

**20080002562** Naval Postgraduate School, Monterey, CA USA

**Personal Information Search on Mobile Devices**

Akbas, Mehmet; Sep 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473710; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Today's mobile devices, especially mobile phones, are comparable in computing capability and storage to the desktop computers of a few years ago. The volume and diversity of the information kept on mobile devices has continually increased and users have taken advantage of this. Since information is being stored on multiple devices, searching for and retrieving the desired information has become an important function. This thesis focuses on search with regard to Personal Information Management (PIM) on mobile devices. A search system which involves different types of mobile devices is also introduced.

DTIC

*Information Retrieval; Management Information Systems; Radiotelephones*

**61**

**COMPUTER PROGRAMMING AND SOFTWARE**

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

**20080000359** Army Engineer Research and Development Center, Vicksburg, MS USA

**Flow Model Study for Section 227 Demonstration Project in Allegan County, Michigan. National Shoreline Erosion Control Development and Demonstration Program**

Hansen, Clarissa P; Howington, Stacy E; Glynn, M E; Sep 2007; 61 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472127; ERDC-TR-07-12; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472127>

The National Shoreline Erosion Control Development and Demonstration Program (Section 227) is authorized by Congress under Section 227 of the Water Resources and Development Act of 1996. The program provides funding to research projects for the development and evaluation of innovative methods of shoreline erosion abatement. This report describes a numerical flow model developed for the Allegan County Bluff Stabilization Project within the Section 227 Demonstration Program. The Bluff Stabilization Site is located just north of Southaven, MI, and lies on the east coast of Lake Michigan. Bluff

recession and subsequent property loss from bluff erosion is a perpetual process along the coastlines of the Great Lakes. Historically, engineers have protected the toe of the bluff from erosion with seawalls, revetments, dikes, etc., to slow bluff recession. For many bluffs, toe protection helps little because the bluff (slope) frequently fails above the protected toe, at elevations affected by perched water tables exiting at the bluff face. The Bluff Stabilization Project has focused on the study and control of the groundwater within the bluffs and measurement of its effect on slope stability. The project has spanned over 11 years, led by Dr. Ronald Chase at Western Michigan University, Kalamazoo, MI. The many years of data exhibit a positive correlation between slope movement, freezing ambient air temperatures, and increased soil pore pressures. Thus, decreasing the pore pressures during freezing temperatures may reduce bluff recession. A dewatering program was started in 2005 to test this hypothesis. This report describes the development of a numerical model of groundwater flow for the purpose of optimizing pumping at the test site. The flow model was constructed using the Groundwater Modeling System (GMS) with the computational code, ADaptive Hydrology/Hydraulics (ADH).

DTIC

*Cliffs; Corrosion Resistance; Erosion; Michigan; Shorelines; Slopes; Stability*

**20080000360** Army Research Development and Engineering Command, Warren, MI USA

**Vehicle Level Human Performance Modeling for Military Vehicle Simulation**

Miller, Jennifer; Mohammad, Syed; Jun 12, 2007; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472143; TARDEC-17137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472143>

The U.S. Army Research, Development, and Engineering Command Tank Automotive Research, Development, and Engineering Center (RDECOM TARDEC) is currently developing a Vehicle Level Human Performance Model (VLHPM) as an advance design tool that can operate alone or in coordination with human research participants. This model has been used to reduce the number of participants necessary for testing vehicle capabilities, effective survivability measures, and joint operability and its functionality is being expanded for use in upcoming experiments. The VLHPM has benefited RDECOM by providing a portable alternative to human participant use, reducing development of prototypes, manpower costs and the need for training. This paper discusses the structure and capabilities of the model, architectural challenges of developing and integrating the model, and factors involved in testing and verifying the model.

DTIC

*Computerized Simulation; Human Performance; Performance Prediction; Simulation*

**20080000374** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Integrated Corrective Action Process Phase D Interactive Database**

Dewitt, Jeffrey T; Sep 1, 2007; 131 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472167; TARDEC-17122-RC; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472167>

The Integrated Corrective Action Team (ICAT) designed the Integrated Corrective Action Process (ICAP) to help the Warfighter, who is everyone that is involved with defending the USA, by reducing the time and resources required to resolve their engineering issues. In addition to the ICAP, a secure online collaborative database is required to reduce the time and resources required to resolve these engineering issues. The development of the database is the last phase of the ICAP. It has been determined that the Windchill(TM) software seems to offer the features that the ICAT is looking for. To break ground in Phase D, a gap analysis will be performed between the requirements of the ICAP and the capabilities of Windchill(TM). The Integrated Corrective Action Team (ICAT) needs the development of a collaborative environment that is secure and accessible to all authorized users that will track, store, and archive information while aiding in streamlining the ICAP.

DTIC

*Data Bases; Engineering; Project Management; Software Development Tools*

**20080000429** Army Engineer Research and Development Center, Vicksburg, MS USA

**Hydraulic Losses in River Meanders**

Brown, Gary L; Copeland, Ronald R; Fischenich, Craig; Aug 2007; 6 pp.; In English

Report No.(s): AD-A472279; ERDC-TN-EMRRP-SR-41; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472279>

Energy losses along a channel reach occur from friction along the channel boundaries and bed surface and channel



irregularities, obstructions, vegetation, channel meandering, and many other parameters of lesser importance. Conventional application of hydraulic computations between two cross sections requires that these losses be represented by the application of a resistance or roughness coefficient. These coefficients are determined empirically. Although much research has been expended developing relations for resistance due to grain size, bed form, and vegetation, relatively little research has focused on the influence of channel meanders. This shortcoming has implications in stream restoration practice for urban channels because many designs include sinuous channels in areas where flooding impacts must be assessed. This technical note discusses and analyzes several methods to estimate the hydraulic loss induced by river meanders (hereafter referred to as meander losses). These methods may be used to adjust the channel Manning's roughness coefficient used in hydraulic calculations and in numerical models such as HEC-RAS, HEC-2 and HEC-6. A method is recommended, with conditions, and topics of further study are suggested in this technical note.

DTIC

*Losses; Meanders; Rivers*

**2008000553** California State Univ., Long Beach, CA USA

**Southern California Agile Supply Network. Strategic Mobility 21**

Mallon, Lawrence G; Kulick, Beth; Aug 31, 2007; 46 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-C-0060-0016

Report No.(s): AD-A472307; CR-0016; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document describes a modeling framework, the Southern California Agile Supply Network (SCASN) simulation modeling system. This model, contracted to support SM21 for regional initiatives currently within Southern California, is intentionally designed to be flexible and generic such that it can be applied to any region or agile networking scenario.

DTIC

*Computer Programs; Manuals; Mobility; Networks; Supplying*

**2008000562** Department of Defense, Arlington, VA USA

**Information Technology Management: Defense Information Systems Agency Controls of the Center for Computing Services Placed in Operation and Tests of Operating Effectiveness for the Period December 1, 2005, through July 31, 2006**

Granetto, Paul J; Marsh, Patricia A; Remington, Patricia C; Luecke, Suzette L; Tran, Anh; Davitt, Michael L; Lam, Chi H; Lee-Baynard, Chanda D; Olberding, Danial; Fine, Ernest; Nov 15, 2006; 67 pp.; In English

Report No.(s): AD-A472324; IG/DOD-D-2007-022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report is intended for the use of Defense Information Systems Agency (DISA) management, its user organizations, and the independent auditors of its user organizations. The DoD Office of Inspector General is implementing a long-range strategy to conduct audits of DoD financial statements. The Chief Financial Officers Act of 1990, as amended, mandates that agencies prepare and conduct audits of financial statements. The reliability of information processed at the DISA sites directly impacts the ability of DoD to produce reliable, and ultimately auditable, financial statements, which is key to achieving the goals of the Chief Financial Officers Act. This report focuses on the DISA Center for Computing Services (CS). CS provides computer processing for the entire range of combat support functions; including transportation, logistics, maintenance, munitions, engineering, acquisition, finance, medicine, and military personnel readiness. CS offers computing services on both CS- and customer-owned platforms including computer operations, data storage, systems administration, security management, capacity management, system engineering, web and portal hosting, architectural development, and performance monitoring. This examination assessed controls defined by DISA over the CS environment. The report provides an opinion on the fairness of presentation by DISA of its description of controls, the suitability of the design of controls, and the operating effectiveness of key controls that are relevant to audits of a user organization's financial statements. As a result, this examination may preclude the need for additional audits of general controls such as those that were previously performed by user organizations to plan or conduct financial statement and performance audits. This examination will also provide a separate audit report with recommendations to management for correction of identified internal control deficiencies.

DTIC

*Computer Networks; Information Systems; Security*

**20080000589** Information Assurance Technology Analysis Center, Herndon, VA USA

**Software Security Assurance: A State-of-Art Report (SAR)**

Goertzel, Karen M; Winograd, Theodore; McKinley, Holly L; Oh, Lyndon J; Colon, Michael; McGibbon, Thomas; Fedchak, Elaine; Vienneau, Robert; Jul 31, 2007; 396 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): SPO700-98-D-4002

Report No.(s): AD-A472363; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Information Assurance Technology Analysis Center (IATAC) State-of-the-Art (SOAR) describes the current 'state-of-the-art' in software security assurance. It provides an overview of the current state of the environment in which defense and national security software must operate then surveys current and emerging activities and organizations involved in promoting various aspects of software security assurance. The SDAR also describes the variety of techniques and technologies in use in government, industry, and academia for specifying, acquiring, producing, assessing, and deploying software that can, with a justifiable degree of confidence, be said to be secure. Finally, the SOAR presents observations about noteworthy trends in software security assurance as a discipline.

DTIC

*Computer Information Security; Computer Programming; Security; Software Engineering*

**20080000610** Carnegie-Mellon Univ., Pittsburgh, PA USA

**CMMI (Trademark) Version 1.2, Training Changes**

Jan 2006; 30 pp.; In English

Report No.(s): AD-A472434; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this module is to describe the major changes to the CMMI Training for version 1.2. Topics include: Introduction to CMMI; Intermediate Concepts of CMMI; Instructor Training; SCAMPI Training; Examinations.

DTIC

*Education; Project Management*

**20080000643** Army Engineer Research and Development Center, Vicksburg, MS USA

**Availability of Patch Calculator, an ArcGIS v.9 Tool for the Analysis of Landscape Patches**

Lin, Jeff P; Sep 2007; 4 pp.; In English

Report No.(s): AD-A472519; ERDC-TN-EMRRP-EM-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This technical note announces the availability of Patch Calculator, a tool developed by the U.S. Army Engineer Research and Development Center (ERDC) for ESRI's ArcGIS Desktop, version 9 software. Patch Calculator is run through the ArcToolbox application, and can be used to calculate several patch and landscape-related metrics, with the results output as patches and/or a study area (e.g., subwatersheds) shapefile. The results can then be used to support various habitat/ecosystem/watershed modeling and management activities.

DTIC

*Calculators; Ecosystems; Terrain; Topography*

**20080000770** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**Matlab based Toolkits used to Interface with Optical Design Software for NASA's James Webb Space Telescope**

Howard, Joseph; August 28, 2007; 24 pp.; In English; SPIE Conference, 26-30 Aug. 2007, San Diego, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000770>

The viewgraph presentation provides an introduction to the James Webb Space Telescope (JWST). The first part provides a brief overview of Matlab toolkits including CodeV, OSLO, and Zemax Toolkits. The toolkit overview examines purpose, layout, how Matlab gets data from CodeV, function layout, and using cvHELP. The second part provides examples of use with JWST, including wavefront sensitivities and alignment simulations.

CASI

*Design Analysis; James Webb Space Telescope; Optical Equipment; Computer Programs*

**20080000867** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**General Mission Analysis Tool (GMAT) Acceptance Test Plan [Draft]**

Dove, Edwin; Hughes, Steve; May 21, 2007; 136 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A07, Hardcopy

The information presented in this Acceptance Test Plan document shows the current status of the General Mission

Analysis Tool (GMAT). GMAT is a software system developed by NASA Goddard Space Flight Center (GSFC) in collaboration with the private sector. The GMAT development team continuously performs acceptance tests in order to verify that the software continues to operate properly after updates are made. The GMAT Development team consists of NASA/GSFC Code 583 software developers, NASA/GSFC Code 595 analysts, and contractors of varying professions. GMAT was developed to provide a development approach that maintains involvement from the private sector and academia, encourages collaborative funding from multiple government agencies and the private sector, and promotes the transfer of technology from government funded research to the private sector. GMAT contains many capabilities, such as integrated formation flying modeling and MATLAB compatibility. The propagation capabilities in GMAT allow for fully coupled dynamics modeling of multiple spacecraft, in any flight regime. Other capabilities in GMAT include: user definable coordinate systems, 3-D graphics in any coordinate system GMAT can calculate, 2-D plots, branch commands, solvers, optimizers, GMAT functions, planetary ephemeris sources including DE405, DE200, SLP and analytic models, script events, impulsive and finite maneuver models, and many more. GMAT runs on Windows, Mac, and Linux platforms. Both the Graphical User Interface (GUI) and the GMAT engine were built and tested on all of the mentioned platforms. GMAT was designed for intuitive use from both the GUI and with an importable script language similar to that of MATLAB.

Author

*Graphical User Interface; Simulation; Software Reliability; Spacecraft Orbits*

**20080000874** NASA Langley Research Center, Hampton, VA, USA

**Solving the AI Planning Plus Scheduling Problem Using Model Checking via Automatic Translation from the Abstract Plan Preparation Language (APPL) to the Symbolic Analysis Laboratory (SAL)**

Butler, Ricky W.; Munoz, Cesar A.; Siminiceanu, Radu I.; November 2007; 47 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/TM-2007-215089; L-19395; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000874>

This paper describes a translator from a new planning language named the Abstract Plan Preparation Language (APPL) to the Symbolic Analysis Laboratory (SAL) model checker. This translator has been developed in support of the Spacecraft Autonomy for Vehicles and Habitats (SAVH) project sponsored by the Exploration Technology Development Program, which is seeking to mature autonomy technology for the vehicles and operations centers of Project Constellation.

Author

*Autonomy; Habitats; Translating; Scheduling*

**20080000916** NASA Langley Research Center, Hampton, VA, USA

**The ANMLite Language and Logic for Specifying Planning Problems**

Butler, Ricky W.; Siminiceanu, Radu I.; Munoz, Cesar A.; November 2007; 54 pp.; In English

Report No.(s): NASA/TM-2007-215088; L-19405; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000916>

We present the basic concepts of the ANMLite planning language. We discuss various aspects of specifying a plan in terms of constraints and checking the existence of a solution with the help of a model checker. The constructs of the ANMLite language have been kept as simple as possible in order to reduce complexity and simplify the verification problem. We illustrate the language with a specification of the space shuttle crew activity model that was constructed under the Spacecraft Autonomy for Vehicles and Habitats (SAVH) project. The main purpose of this study was to explore the implications of choosing a robust logic behind the specification of constraints, rather than simply proposing a new planning language.

Author

*Autonomy; Proving; Space Shuttle Orbiters; Artificial Intelligence; Planning*

**20080000921** Carnegie-Mellon Univ., Pittsburgh, PA USA

**CMMI (Trademark) Version 1.2, SCAMPI A Appraisal Method Changes**

Jan 2006; 14 pp.; In English

Report No.(s): AD-A472433; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this module is to describe the major changes to the SCAMPI A appraisal method for version 1.2.

DTIC

*Project Management; Charts*

**20080000952** Army Engineer Research and Development Center, Vicksburg, MS USA

**Availability of an ArcGIS Wetland Restoration Spatial Decision Support System (SDSS) Tool**

Lin, Jeff P; Kleiss, Barbara A; Sep 2007; 4 pp.; In English

Report No.(s): AD-A472527; ERDC-TN-EMRRP-EM-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472527>

This technical note announces the availability of a tool developed by the U.S. Army Engineer Research and Development Center (ERDC). The tool and accompanying user's guide can be used to create an ArcGIS-based wetland restoration spatial decision support system (SDSS) tool. An SDSS is useful for evaluating and comparing multiple areas across a large study area, and works by scaling and combining multiple, spatially explicit data layers within a geographic information system (GIS). The purpose of this tool and user's guide is to help those involved in wetland restoration planning create their own area-specific, GIS-based wetland restoration SDSS, which can be used to identify and evaluate potential wetland restoration sites at a landscape or watershed scale.

DTIC

*Decision Support Systems; Restoration; Software Development Tools*

**20080000972** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Modifiability Tactics**

Bachmann, Felix; Bass, Len; Nord, Robert; Sep 2007; 63 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472581; CMU/SEI-2007-TR-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472581>

An architectural tactic is a design decision that affects how well a software architecture addresses a particular quality attribute. This report describes how tactics are based on the parameters of quality attribute models. Tactics provide an architectural means of adjusting those parameters, which, in turn, can improve the quality-attribute-specific behavior of the resulting system. This report justifies the tactics for modifiability, using established concepts of coupling, cohesion, and cost motivations as the means of identifying parameters of interest. Various tactics are then described based on their ability to control these parameters. The report also describes a standard set of architectural patterns and their variants in terms of the use of these tactics.

DTIC

*Cohesion; Computer Programming; Software Engineering; Tactics*

**20080000973** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Dependability Modeling with the Architecture Analysis & Design Language (AADL)**

Feiler, Peter; Rugina, Ana; Jul 2007; 87 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472582; CMU/SEI-2007-TN-043; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472582>

The Society for Automotive Engineers (SAE) recently published an Error Model Annex document (SAE AS-5506/1) to complement the SAE Architecture Analysis & Design Language (AADL) standard document (SAE AS5506) with capabilities for dependability modeling. The purpose of this report is to: (1) explain the capabilities of the Error Model Annex and (2) provide guidance on the use of the AADL and the error model in modeling dependability aspects of embedded system architectures. The focus of the guidance is the creation of error model libraries and the instantiation of these error models on AADL architecture models. In that context, the report discusses modeling of error propagation, error filtering and masking, the interactions between error models and systems with operational modes, and modeling of repair activities.

DTIC

*Architecture (Computers); Computer Techniques; Error Analysis; Maintenance; Models*

**2008000975** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Certified Binaries for Software Components**

Chaki, Sagar; Ivers, James; Lee, Peter; Wallnau, Kurt; Zeilberger, Noam; Sep 2007; 41 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472584; CMU/SEI-2007-TR-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472584>

Proof-carrying code (PCC) and certifying model checking (CMC) are two established paradigms for obtaining objective confidence in the runtime behavior of a program. PCC enables the certification of low-level binary code against relatively simple (e.g., memory-safety) policies. In contrast, CMC provides a way to certify a richer class of temporal logic policies, but is typically restricted to high-level (e.g., source) code. In this report, an approach is presented to certify binary code against expressive policies, and thereby achieve the benefits of both PCC and CMC. This approach generates certified binaries from software specifications in an automated manner. The specification language uses a subset of UML statecharts to specify component behavior and is compiled to the Pin component technology. The overall approach thus demonstrates that formal certification technology is compatible with, and can indeed exploit, model-driven approaches to software development. Moreover, this approach allows the developer to trust the code that is produced without having to trust the tools that produced it. In this report details of this approach are presented and experimental results on a collection of benchmarks are described.

DTIC

*Computer Programs; Program Verification (Computers)*

**2008000976** Carnegie-Mellon Univ., Pittsburgh, PA USA

**T-Check(Servicemark) for Technologies for Interoperability: Open Grid Services Architecture(OGSA) - Part 1**

Simanta, Soumya; Lewis, Grace A; Wrage, Lutz; Apr 2007; 53 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472585; CMU/SEI-2007-TN-016; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472585>

Many current technology approaches exist for building systems that have interoperability requirements. This report investigates Open Grid Services Architecture (OGSA), one of the many technologies for accomplishing interoperability, using the T-Check technique. A T-Check is a simple and cost-efficient way to understand what a technology can and cannot do in a specific context. This report describes a T-Check exploration of the feasibility of using OGSA in the context of data management, finding that OGSA (a) provides data storage and retrieval where the specific implementation of the data store implementation is transparent and (b) allows addition or removal of data stores at runtime without affecting system operation. This report is part one of a two-part investigation; part two will look at OGSA in the context of load distribution.

DTIC

*Computer Networks; Interoperability*

**20080001001** CFD Research Corp., Huntsville, AL USA

**Integrated Modeling Framework for Anthropometry and Physiology Virtual Body**

Wilkerson, Patrick; Pzrekwas, Andrzej; Jun 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-06-M-6707; Proj-3005

Report No.(s): AD-A472630; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472630>

This paper presents a software framework for visual manipulation and processing of human body anthropometric, skeletal, vascular and other anatomical databases.

DTIC

*Anatomy; Anthropometry; Biomedical Data; Information Systems; Models; Systems Integration*

**20080001195** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Developing AADL Models for Control Systems: A Practitioner's Guide**

Hudak, John; Feiler, Peter; Jul 2007; 85 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472931; CMU/SEI-2007-TR-014; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document is a guide to help practitioners using the Architecture Analysis and Design Language (AADL), an international industry standard for the model-based engineering of real-time and embedded systems. The primary goal of this document is to describe an approach for and the mechanics of constructing an architectural model that can be analyzed based on the AADL. The first section of this document presents an overview of AADL concepts and many of the keywords of the language. The second part of the document illustrates a model-building approach using the AADL. It takes the perspective of an engineer who is developing a model for the first time using the AADL. This guide leads the reader through complete AADL model development based on automotive embedded control systems (cruise control, traction control, etc.) by describing the use and syntax of the AADL and interleaving modeling abstraction tradeoffs to achieve models that are abstract but precise. Models are constructed with different analysis perspectives in mind to illustrate the semantics as well as the richness of the AADL.

DTIC

*Programming Languages; Systems Engineering*

**20080001223** Defence Research and Development Canada, Toronto, Ontario Canada

**Accelerated Training for Command Dynamic Decision Making: A Pilot Study Using Microworlds**

Jarmasz, Jerzy; Dec 2006; 66 pp.; In English; In English; Original contains color illustrations

Report No.(s): AD-A472981; DRDC-TR-2006-239; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Dynamic Decision Making (DDM) is a skill that is both increasingly required and difficult to train for military commanders in today's security environment. Because it requires the timely sequencing of interdependent decisions in order to control complex and non-linear systems, DDM is a difficult skill to acquire for humans. Microworlds, which are stripped down simulations that focus on the dynamics of the target systems, have been proposed by many as training environments for DDM that avoid the time commitment, cost and personal danger of training command decision making with full-scale exercises or through mission experience. However, little research has been conducted on the factors that lead to effective microworld-based training. Specifically, it is unknown whether the time compression that occurs in microworlds enhances or inhibits the learning and transfer of complex system dynamics. A pilot study was conducted to examine whether participants are able to learn a simple DDM task in an accelerated microworld environment and then perform the same task in a similar but much slower environment. The results suggest that compressed-time microworlds can support training and transfer of DDM skills to 'real-time' environments but that much remains to be learned about the conditions that favour the learning of DDM skills. Based on these results, general considerations for training DDM with microworlds and specific recommendations for improving the current study are provided.

DTIC

*Computerized Simulation; Decision Making; Education*

**20080001241** Humansystems, Inc., Guelph, Ontario Canada

**Team Modelling: Literature Review**

Sartori, Jessica A; Waldherr, Sonya; Adams, Barbara D; Aug 2006; 149 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7711-04-7911/001/TOR

Report No.(s): AD-A473022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Increasingly, Canadian Forces operations require the use of highly complex teams that function in joint, interagency, and often distributed environments. This report is a literature review of scientific and military research pertaining to team performance. This review consists of three sections. First, the factors influencing team performance are explored, and three major sets of factors are considered in relation to team performance: team factors, task factors, and team processes. Although very large, the team performance research has generally not built progressively upon previous work and illustrates equivocal results. Nonetheless, it is clear that characteristics of the team, the task, and team processes are all important influences on team performance. However, exactly how each of these factors influences team performance is often dependent on other factors. Moreover, the majority of the existing team research is limited in that it has not generally been conducted in realistic settings. The second section addresses measures of team performance, considers the conceptual challenges of measuring team performance, and explores specific measures of team processes and outcomes. The final section reviews some conceptual and

computational models of team performance. Although models have generally not been subject to extensive validation efforts, they provide confirmation of the factors that are prominent throughout the team literature. The review ends with a short overview of the literature, and recommendations for a program of team research. Specifically, the existing team literature is inadequate with respect to understanding distributed teams consisting of people from diverse backgrounds and experience. Moreover, as teams of the future are also likely to be increasingly complex, more understanding of how heterogeneous teams as well as an entire team of teams will function in distributed, joint, and interagency environments will be critical.

DTIC

*Human Performance; Models; Simulation; Surveys; Teams*

**20080001242** Humansystems, Inc., Guelph, Ontario Canada

**Observation of Computer-Supported, Collaborative Work Tool Usage during Briefing and Debriefing Phases of Coalition Mission Training Research for Maple Skies**

Bennett, Jeff; Lamoureux, T M; Mar 2006; 61 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473023; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Coalition Mission Training Research (CMTR) Computer-Supported, Collaborative Work (CSCW) system allows geographically separated participants to collaborate during mission planning and briefing/debriefing. Collaboration within the CMTR environment is focused on facilitating task-oriented communication among team members. The opportunity was taken to conduct a video analysis and questionnaire survey of participants in a distributed briefing and debriefing environment during the Maple Skies simulation training event. The video analysis focused on behaviours exhibited by participants such as how many turns they had, how long each phase of the briefing lasted, collaborative tool use, gestures, and interruptions. The questionnaire survey solicited a participant's feelings on how well the collaborative tools facilitated the distributed briefings and debriefings. The results of these investigations are reported and recommendations for future development of this work are made.

DTIC

*Education; Software Development Tools*

**20080001252** California Univ., Berkeley, CA USA

**Binning in Gaussian Kernel Regularization**

Shi, Tao; Yu, Bin; Apr 2005; 38 pp.; In English

Contract(s)/Grant(s): DAAD19-01-01-0643

Report No.(s): AD-A473041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Gaussian kernel regularization is widely used in the machine learning literature and proven successful in many empirical experiments. The periodic version of the Gaussian kernel regularization has been shown to be minimax rate optimal in estimating functions in any finite order Sobolev spaces. However, for a data set with  $n$  points, the computation complexity of the Gaussian kernel regularization method is of order  $O(n^3)$ . In this paper we propose to use binning to reduce the computation of Gaussian kernel regularization in both regression and classification. For the periodic Gaussian kernel regression, we show that the binned estimator achieves the same minimax rates of the unbinned estimator, but the computation is reduced to  $O(m^3)$  with  $m$  as the number of bins. To achieve the minimax rate in the  $k$ -th order Sobolev space,  $m$  needs to be in the order of  $O(kn^{1/(2k+1)})$ , which makes the binned estimator computation of order  $O(n)$  for  $k = 1$  and even less for larger  $k$ . Our simulations show that the binned estimator 'binning 120 data points into 20 bins in our simulation' provides almost the same accuracy with only 0.4% of computation time. For classification, binning with the L2-loss Gaussian kernel regularization and the Gaussian kernel Support Vector Machines is tested in a polar cloud detection problem. With basically the same computation time, the L2-loss Gaussian kernel regularization on 966 bins achieves better test classification rate '79.22%' than that '71.40%' on 966 randomly sampled data. Using the OSU-SVM Matlab package, the SVM trained on 966 bins has a comparable test classification rate as the SVM trained on 27,179 samples, but reduces the training time from 5.99 hours to 2.56 minutes. The SVM trained on 966 randomly selected samples has a similar training time as and a slightly worse test classification rate than the SVM on 966 bins, but has 67% more su

DTIC

*Kernel Functions; Machine Learning; Numerical Analysis; Quadratures*

**20080001256** Engineering Research and Consulting, Inc., Edwards AFB, CA USA

**Surface Roughness Effects in Low Reynolds Number Channel Flows (POSTPRINT)**

Gimelshein, N; Duncan, J; Lilly, T; Gimelshein, S; Ketsdever, A; Wysong, I; Jul 2006; 9 pp.; In English

Contract(s)/Grant(s): Proj-23080532

Report No.(s): AD-A473047; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rarefied helium and nitrogen flow expanding into vacuum through 150 micron high and 1.5 cm long channels is studied experimentally and numerically with the DSMC method. Different types of channel walls are examined, both polished and rough with well characterized roughness shaped as triangles and rectangles. The pressure varies from 200 to 13,000 Pa, with the gas mean free path being both much larger and much smaller than the roughness size of about 20 micron. A conical surface roughness model applicable for the DSMC method is proposed. An expression relating this model to the Cercignani-Lampis scattering model is derived. Good agreement between the numerical and experimental results is observed for the rough walled channel.

DTIC

*Channel Flow; Flow Velocity; Gas Flow; Low Reynolds Number; Rarefied Gas Dynamics; Reynolds Number; Surface Roughness; Surface Roughness Effects*

**20080001257** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Hybrid Electric Vehicle Experimentation and Assessment (HEVEA)**

Allen.; Aug 7, 2007; 4 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473048; RDECOM/TARDEC-17522; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the Hybrid Electric Vehicle Experimentation and Assessment (HEVEA) research program is to 1) Develop Hybrid Electric Vehicle (HEV) Fuel Economy and performance Test Operating Procedures (TOP); 2) Determine the fuel economy benefits of HEV using quantifiable test data; 3) Develop and validate TARDEC M&S models; and 5) Provide a tool to predict hybrid electric drive cycle performance and fuel economy. TARDEC is currently testing 9 conventional and 7 hybrid electric vehicles.

DTIC

*Electric Motor Vehicles*

**20080001260** Gorla Consultants, Inc., Strongsville, OH USA

**Exergy Analysis for Energy Systems**

Gorla, Rama S; Sep 2006; 195 pp.; In English

Contract(s)/Grant(s): Proj-A03I

Report No.(s): AD-A473052; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In Phase Change transport devices, capillary forces drive the overall circulation of working fluid from an evaporator to a condenser section. An analysis has been provided for the entropy generated for the combined heat and mass transfer in a circular tube and micro/nano scale heat and mass transfer in a capillary tube in terms of the gradients of velocity, temperature, and concentration as well as the physical properties of the fluid. The heat and mass transfer rates are assumed to be uniform on the surface of the tube. The optimum geometric configuration that corresponds to the minimization of entropy generated and minimization of fluid flow resistance is identified.

DTIC

*Entropy; Fluid Flow; Heat Transfer; Osmosis*

**20080001474** MacDonald, Dettwiler and Associates Ltd., Dartmouth, Nova Scotia Canada

**Trial Analysis Tools: A Call-Up Under the Noise Monitoring Standing Offer**

Glessing, Brad; Macmichael, Cory; Burnett, Derek; Dec 2005; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707-04-2638

Report No.(s): AD-A473025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents the work done to aid in the production of reconstruction products that provide a summary of scientific trials. During this call-up an analysis tool was created to support production of these trial summary reports. The resulting analysis tool was designed to be extendable so that future call-ups could easily reuse it. In addition, several



enhancements were made to the existing Interactive Data Language (IDL)-based Software Tools for Analysis and Research (STAR) software, to support the new trial reconstruction tool.

DTIC

*Computer Programs; Software Development Tools*

**20080001476** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Proposed Architecture for Data Sharing in the Networked Underwater Warfare Project**

Isenor, Anthony W; Jan 2006; 78 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473014; DRDC-ATLANTIC-TM-2005-159; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work discusses topics related to data sharing and understanding in a network-enabled environment. A critical component of a successful implementation of network-enabled operations (NEOps) will be the client's ability to judge the importance of the received data as well as understand the content of the received data. In the NEOps environment, many clients will enter the network unaware of the available data assets. A discovery process is required for the client to first identify the available resources. Once identified, the client will require information on the structure used to deliver the data to the client. Then, the client will need information on the details of the data items present within the structure. This work proposes an architecture suitable for the discovery and understanding process. The architecture is based on a vocabulary, or dictionary of terms, and a definition of data structures. An example implementation is provided using extensible markup language. The Networked Underwater Warfare Technology Demonstration Project underway at DRDC Atlantic provides an implementation focus for the data sharing concepts presented in this work.

DTIC

*Data Bases; Warfare*

**20080001483** MacDonald, Dettwiler and Associates Ltd., Dartmouth, Nova Scotia Canada

**STAR Towed Array Display Upgrade**

Widdis, Chris; Hood, Joe; Dec 2005; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707-052986/001/HAL

Report No.(s): AD-A472979; DRDC-ATLANTIC-CR-2005-234; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents the work done to enhance the Software Tools for Analysis and Research (STAR) by creating displays appropriated for data collected using towed arrays. The STAR software suite was developed to support general research and analysis objectives at Defense R&D Canada (DRDC) - Atlantic. Though relatively generic, many of the STAR displays had been tuned to meet the requirements of sonobuoy analysis with a single display pane displaying data from a single receiver / beam combination. Under this contract, three displays were added to aid in visualizing and analyzing large amounts of Energy Time Indicator (ETI) data on a single image. These summary displays provide a more intuitive view of the available information. New displays include a beam map display, a polar beam map display, and an on-demand beam clutter display. Each new display contains a single image with intensity represented by a grey-scale or color-map. For the beam map display, the time varying intensity of all beams from a single receiver is shown. On the polar map display, monostatic or multistatic data is mapped onto a geographic display. The beam clutter display maps the time varying intensity from many pings for a single receiver / beam combination onto a single image. The last display previously existed, but it can now be generated 'on-the-fly'. A number of display options are user-modifiable at run-time using a number of custom settings dialogues. Options include quantization selection, color scale modification and interpolation, decimation and gridding algorithm selection, to name a few. Finally, a new method of outputting data to image based Surveillance Acoustics Plotting (SAPLOT) files were implemented. This new output format will simplify formatting of figures for reports and papers.

DTIC

*Computer Programs; Display Devices; Software Development Tools*

**20080001486** Army Engineer Research and Development Center, Vicksburg, MS USA

**Application of a Water Quality Model to Mississippi Sound to Evaluate Impacts of Freshwater Diversions**

Dortch, Mark S; Zakikhani, Mansour; Noel, Mark R; Kim, Sung-Chan; Sep 2007; 889 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472574; ERDC/EL-TR-07-20; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472574>

This report describes the development and application of a water quality model to the Mississippi Sound region to address

the impacts of various freshwater diversion alternatives. The CH3D-Sigma (sigma level vertical coordinates) model code was the hydrodynamic model that was used to provide transport fluxes for the CE-QUAL-ICM water quality model. The model domain also included Mobile Bay, the Mississippi coastal bays, Lakes Pontchartrain and Borgne, Biloxi Marsh, and part of Breton Sound. The three-dimensional model had five sigma coordinate vertical layers. The model included 15 water quality variables including temperature, salinity, inorganic and total suspended solids (TSS), dissolved oxygen, dissolved and particulate organic carbon, various forms of inorganic and organic nitrogen and phosphorus, phytoplankton biomass, chlorophyll a, and underwater light extinction. The model was calibrated for the period April through September 1998. Three diversions were simulated, diversion of freshwater flow from the Mississippi River at Bonnet Carre' spillway and into Lake Borgne near Violet, LA, and diversion of all of the Escatawpa River flow into Grand Bay. Summer average salinity was decreased along the western portions of Mississippi Sound by as much as 11 parts per thousand for the Bonnet Carre' diversion. For the Violet diversion, summer average salinity reductions were as great as 6 to 8 parts per thousand in western Mississippi Sound. The Escatawpa River diversion had little effect on Mississippi Sound. The Mississippi River diversion will also result in higher concentrations of nutrients, TSS, phytoplankton, and TOC, and greater light extinction, thus, less light reaching the bottom.

DTIC

*Fresh Water; Sounds (Topographic Features); Water Quality*

**20080001492** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Information Visualization: The State of the Art for Maritime Domain Awareness**

Davenport, Michael; Risley, Chris; Aug 2006; 180 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707-053019/001/HAL

Report No.(s): AD-A472951; MDA-RX-RP-52-4186; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Final Report provides an analysis of the current state of the art for Information Visualization, as it applies to Maritime Intelligence, Surveillance, and Reconnaissance (MISR). It comprises a Literature Survey, an Annotated Bibliography, a Product Review, and recommendations for further research. The Literature Survey focuses on visualization algorithms and strategies, human factors for visualization, and emerging display hardware, and includes a list of foundational books and papers, an introduction to major research leaders, and a list of current pressing research questions. The Annotated Bibliography provides about 240 references to texts, conferences, journals, and institutional websites. The Product Review gives one-page descriptions of sixty eight MISR-related visualization products, ranging from public-domain code for a specific visualization task, to commercial multipurpose toolkits. The report concludes by recommending specific research tasks for visualizing sensor coverage and ignorance, ship tracks in time and space, ship tracks versus normal tracks, and attribute data such as cargo and crew.

DTIC

*Industries; Intelligence; Reconnaissance; Surveillance*

**20080001524** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Process Improvement Should Link to Security: SEPG 2007 Security Track Recap**

Woody, Carol; Sep 2007; 37 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A473002; CMU/SEI-2007-TN-025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Security is a very visible issue these days for software. New software products are continuously reported to be vulnerable to attack and compromise; organizations must support an expensive unending update-and-upgrade cycle. Process improvement has been proposed as a mechanism for addressing security challenges, but the Capability Maturity Model Integration (CMMI[registered name]) approach does not specifically address security, so the linkages for the Software Engineering Process Group (SEPG) community are unclear. The security track at the SEPG 2007 conference was developed to provide a forum for identifying the appropriate ties between process improvement and security. This document summarizes the content shared at the conference and identifies several subsequent steps underway toward strengthening those ties.

DTIC

*Security; Linkages; Identifying*

**20080001592** Air Force Research Lab., Rome, NY USA

**Expert System Constant False Alarm Rate (CFAR) Processor**

Wicks, Michael C; Sep 2006; 25 pp.; In English

Report No.(s): AD-A472792; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Clutter; Expert Systems; False Alarms; Signal Processing*

**20080001646** La Trobe Univ., Victoria, Australia

**Resource Utilisation and Situational Awareness in a Computer Simulated Decision Task: A Pilot Study**

Valentine, Nick; Wearing, Alexander; Omodei, Mary; May 8, 2007; 90 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0334

Report No.(s): AD-A473106; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473106>

Achieving control of dynamic and complex situations is always challenging involving as it does the management of cognitive resources. It has been proposed that one of the leading causes of error in such dynamic environments is a generalised tendency to attempt to use more task resources than one's cognitive capacity can sustain, termed the overutilisation of resources bias 'Omodei, Wearing, McLennan & Hansen, 2001'. The aim of the present study was to explicitly take into account individual differences in cognitive capacity in an investigation of this human tendency to overuse resources, and its proposed effect on decision making efficiency. Sixteen participants 'i.e., 10 female and 6 male' aged between 18 and 32 years completed ten trials of the computer simulated forest fire-fighting task Networked Fire Chief 'Omodei, Taranto & Wearing, 1999'. Adopting a repeated measures design, all participants were administered two conditions: one in which they were given the maximum number of fire fighting resources they were observed to have been able to cognitively manage during earlier training trials 'i.e., MANAGEABLE condition' and one in which they were given double the number of resources supplied in the MANAGEABLE condition 'i.e., EXCESS condition'. It was predicted that a tendency to overuse resources in the EXCESS condition would lead to cognitive overload with a higher experienced mental workload, poorer overall awareness of the situation, and subsequently poorer decision making performance compared to the MANAGEABLE condition. However, there was no significant difference found between conditions for any of these three variables. Further analyses revealed individual differences in the ability to appropriately adapt to the overabundance of resources in the EXCESS condition. It was concluded that individual flexibility in the quality of strategic thought alloc

DTIC

*Cognition; Cognitive Psychology; Computerized Simulation; Decision Making; Situational Awareness; Utilization*

**20080001678** CACI, Inc. - Federal, VA USA

**Integration of Architecture for Behavior and Cognitive Modeling (ABCM) With the Joint Conflict and Tactical Simulation (JCATS)**

Hogan, C M; Van Houten, Robert A; La, Nina; Apr 2003; 21 pp.; In English

Contract(s)/Grant(s): N61339-02-C-0089; Proj-0476

Report No.(s): AD-A473158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473158>

This report describes the effort to demonstrate the flexibility of CACI's Architecture for Behavior and Cognitive Modeling (ABCM) to incorporate and alternate between psychological models. For this project, the models were based on work in CACI's FYO2 Asymmetric Warfare (AM) project. This report also describes the development of a formal process to use Subject Matter Experts (SMEs) in the Knowledge Acquisition (KA) and Verification and Validation (V&V) for a model using a fuzzy rule set Knowledge Base (KB). This plan and process was used to support the development of a more complete commander's model in the Agent-based Modeling and Behavior Representation (AMBR) program. The development involved the design, implementation, and testing of a significant larger, more complete KB, containing a total of 180-200 fuzzy rules. CACI developed two interchangeable psychological rule sets and a cultural and rudimentary socio-political rule set to influence the commander traits. A Graphical User Interface (GUI) was developed to build, analyze, and test the modularity of the psychological rule sets.

DTIC

*Human Behavior; Models; Simulation*

**20080001829** Army Engineer Research and Development Center, Vicksburg, MS USA

**Template for Conceptual Model Construction: Model Components and Application of the Template**

Henderson, Jim E; O'Neil, L J; Sep 2007; 40 pp.; In English

Report No.(s): AD-A473238; ERDC-TN-SWWRP-07-7; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Use of models (conceptual, ecosystem, and decision support models) in systemwide studies is expanding due to requirements for integration of model outputs and due to the emphasis on watershed and regional approaches to water resource problems. Conceptual models assist in integrating the multiple disciplines and models that were brought to bear in a systemwide study providing for a common framework, communication, and identification of significant resources and pathways. By providing a framework for understanding the dynamics and relationships of complex systems, conceptual models are frequently an initial step in development or selection of numerical or dynamic simulation models. This technical note reports on component categories identified for a template for conceptual model construction (template) and presents application of the template. The template for conceptual model construction is being presented in two technical notes; the first identified categories of descriptors (model construction parameters) that characterize the model (Henderson and O'Neil 2007) [ADA471008] and this, the second note, presents the categories of components for the model. A Baltimore District study, the Middle Potomac Watershed Study, is the basis for an application of the template. Development of the Middle Potomac Conceptual Model followed guidance of the six steps outlined in Henderson and O'Neil (2004) [ADA430410], and model descriptor selection, and component specification. The six-step process resulted in careful and deliberate preparation of the models. Further refinement or revision to the process, descriptors, and components will occur as further models are developed.

DTIC

*Templates; Watersheds*

**20080001834** Space and Naval Warfare Systems Center, San Diego, CA USA

**JPEO-CBD Software Support Activity Annual Report 2005**

Hardy, D R; Casciola, G; Park, J; Duffy, L; Macrossen, J; Brimson, D; Snee, B; Milligan, D; Godso, D; Reuben, D; Dec 2005; 66 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473249; SSC-TD-3217; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report provides an annual historical record of the efforts performed by the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) Software Support Activity (SSA) for the Calendar Year 2005. The JPEO-CBD SSA is managed by the Space and Naval Warfare Systems Center San Diego and is directed by the Space and Naval Warfare Systems Command. The SSA is a team composed of government and contractor agencies that provide enterprise support in the key tenets of net-centric operations to U.S. Department of Defense chemical and biological programs.

DTIC

*Information Systems; Protection*

**20080001860** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

**SimNEC: Research Platform for Studying Human Functioning in NCW**

Veen, van, Hendrik-Jan; Graff, de, Bernd; Essens, Peter; Jun 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473298; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Military Technology; Research and Development*

**20080001865** Old Dominion Univ., Norfolk, VA USA

**Challenges and Potential of Service-Oriented Architectures for Net-Centric Operations**

Tolk, Andreas; Gaskins, Ryland C; Jun 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473305; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Command and Control; Human Factors Engineering; Service Oriented Architecture*

**20080001867** Naval Postgraduate School, Monterey, CA USA

**Combined Arms Training: Measures and Methods for a Changing World**

Sadagic, Amela; Darken, Rudolph P; Jun 1, 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473309; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Games*

**20080001873** Soar Technology, Inc., Ann Arbor, MI USA

**Thinking Opposing Force (OPFOR) for Joint Conflict and Tactical Simulation (JCATS)**

Jones, Randy; Aug 2003; 29 pp.; In English

Report No.(s): AD-A473317; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The project discussed in this report focused on two primary research objectives. The first objective was to evaluate the technical feasibility and costs associated with introducing autonomous human behavior models into the Joint Conflict and Tactical Simulation (JCATS) environment. The second objective was to evaluate and recommend improved graphical user interfaces for specifying JCATS entity behaviors, which would aid both scenario generation and execution. This project developed a demonstration scenario for a 'Thinking OPFOR' (Opposing Force) capability for entities in a JCATS Military Operations in Urban Terrain (MOUT) scenario, which drove an analysis of the ability to provide 'thinking' type entities and deploying such entities within the JCATS infrastructure. This analysis was used to propose two alternative solution paths to providing realistic human-like behaviors for JCATS entities. For the second objective, a prototype behavior editor was designed and built to specify autonomous entity behaviors within the current JCATS infrastructure. This prototype was used to analyze design recommendations for alternative types of user interfaces for future JCATS tools.

DTIC

*Graphical User Interface; Human Behavior; Military Operations; Simulation; Warfare*

**20080001892** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

**MSC: Vehicle for Validation of Military Flight Simulation**

Graaf, de, Bernd; Bles, Wim; Wentink, Mark; Tielemans, Willem; Jun 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473339; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Distributed Interactive Simulation; Flight Simulation; Quantitative Analysis; Research Facilities*

**20080001893** Mymic, LLC, Portsmouth, VA USA

**Emerging Requirements for Virtual Simulations**

Jones, Phillip; Jun 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473340; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Simulation*

**20080001894** Naval Research Lab., Washington, DC USA

**Immersive Simulation to Train Urban Infantry Combat**

Templeman, James N; Sibert, Linda E; Page, Robert C; Denbrook, Patricia S; Jun 2006; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473341; XB-NRL/ITD/5500; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Combat; Human-Computer Interface; Simulation; Virtual Reality*

**20080001895** Naval Research Lab., Washington, DC USA

**Mobile Augmented Reality: Applications and Human Factors Evaluations**

Livingston, Mark A; Brown, Dennis G; Julier, Simon J; Schmidt, Greg S; Jun 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473342; XB-NRL/FR/5580; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Display Devices; Human Factors Engineering; Human-Computer Interface; Situational Awareness*

**20080001896** University of Southern California, Marina del Rey, CA USA

**Cognitive Performance Assessment in Mixed and Virtual Environment Systems**

Pair, Jarrell; Rizzo, Albert; Jun 2006; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473343; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Human-Computer Interface; Mental Performance; Performance Tests; Virtual Reality*

**20080001908** Cycorp, Inc., Austin, TX USA

**Accessible Research Cyc**

Lefkowitz, Larry; Curtis, Jon; Witbrock, Michael; Sep 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-04-C-0034; DARPA ORDER-Q101/00; Proj-COGV

Report No.(s): AD-A473356; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project was to produce a knowledge base (named ResearchCyc) and to modularize the Cyc knowledge base so that researchers could make use of just the ontology, or part of the ontology, or the knowledge base (KB), or part of the KB, or the inference engine, or just some heuristic level (HL) modules from the inference engine. Moreover, the goal included the capability for software power tools to provide machine-assisted (i.e., semi-automatic) mapping between Cyc's ontology and a non-Cyc ontology. The capability was aimed at dramatically increased usability (including stability) and modularity of Cyc, leading to widespread use of ResearchCyc by the R&D community. Another task involved a seedling effort to lay the groundwork for a Bootstrapped Learning initiative. This report also describes the results of the Bootstrapped Learning Seedling effort.

DTIC

*Knowledge Based Systems; Mapping*

**20080001912** Auburn Univ., AL USA

**Decision Support Under Uncertainty Using Exploratory Multisimulation with Multiresolution Multistage Models**

Lim, Alvin; Sep 2007; 66 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-1-0200; Proj-459S

Report No.(s): AD-A473361; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In most realistic simulation-supported decision making situations, the nature of the problem changes as the simulation unfolds. Initial parameters, as well as models, can be irrelevant under emergent conditions. Furthermore, our knowledge about the problem being study may not be captured by any single model or experiment. Therefore, adaptively in simulations and scenarios is necessary to deal with emergent conditions and for evolving systems in a flexible manner. Dealing with uncertainty is paramount to analyzing complex evolving phenomena. This effort involved (1) a new advanced simulation methodology, called exploratory multisimulation to promote problem space exploration, as opposed to traditional solution space exploration concept to deal with challenges pertaining to irregular and asymmetric warfare and (2) a symbiotic multisimulation-based decision support system based on the Naturalistic Decision Making paradigm. The decision support system illustrates how situational awareness can be enhanced by intelligent agents with perception, understanding, and anticipation capabilities to support multisimulation-based exploration of this problem area.

DTIC

*Decision Making; Decision Support Systems; Image Resolution*

**20080001913** Florida Inst. for Human and Machine Cognition, Inc., Pensacola, FL USA

**Rapid Community of Interest (COI) Infospaces Creation and Deployment Using KAOS and CMAPS**

Uszok, Andrzej; Bradshaw, Jeff; Sep 2007; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-2-0065; Proj-ICED

Report No.(s): AD-A473364; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The important results of the project include a deepened understanding of the community of interest (COI) lifecycle, definition of requirements for tools supporting COI lifecycle and description of the COI lifecycle dataflow. Additionally, it was shown how consistent usage of ontology in the COI supporting tool can add significant flexibility and richness to the process. The developed COI-Tool has these main features: - Capture and share COI configurations in two synchronized representations - Unique user-friendly Cmap environment with integrated Web Search, simultaneous collaboration and version control - Facilitation of the COI implementation through integration with OIM RI and KAos Policy Service - Reuse of COI models.

DTIC

*Deployment; Internets*

**20080001917** Texas A&M Univ., Galveston, TX USA

**The Future of Simulation**

Loftin, R B; Jun 2006; 56 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473368; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Computerized Simulation; Forecasting; Human-Computer Interface; Simulation*

**20080001925** Naval Postgraduate School, Monterey, CA USA

**VoIPNET: A Software Based Communications Tool for Low-Bandwidth Networks**

Reiche, Jr, Charles P; Jun 2007; 251 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473381; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Maneuver element communications can be divided into Single-Channel Voice, Data Networks, and Telephony. Classified computer networks, such as SIPRNET are pushed to Infantry and Artillery Battalions via the EPLRS radio system. However, telephone services may or may not be supported due to limited availability of Multi-Channel Digital assets. Single-Channel Radio is utilized to communicate with higher, adjacent and subordinate organizations. While this is a sufficient means of communications, it is half-duplex, cumbersome, unreliable, and subject to availability due to net traffic. Voice over IP may be the solution to deploy full duplex telephone communications services to bandwidth deprived organizations, via an existing wireless network infrastructure. The development and testing of a software based 'VoIPNET' prototype proved the EPLRS Network's ability to provide critical primary telephone services, via VoIP, to highly mobile maneuver elements. Detailed requirements analysis and design specifications were developed for future development of the VoIPNET application. In addition, the results of VoipNET Prototype tests on an EPLRS network are compiled into deployment recommendations for units attempting to establish VoIP on an EPLRS network.

DTIC

*Bandwidth; Broadband; Communication Networks; Low Frequencies; Software Development Tools*

**20080001935** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

**Beslisbevoegdheden van de Uitgestegen Soldaat. Deel B: Verbetering van Situational Awareness Met Behulp van de Soldier Digital Assistant in een Gesimuleerde Omgeving (Authority and Responsibility of the Dismounted Soldier. Part B. Improving the Situational Awareness using the Soldier Digital Assistant in a Simulated Environment)**

Verwijs, C; Bruin, R de; Vliet, A J van; Apr 2007; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473401; TNO-DV-2007-A142; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using a simulated environment the hypothesis was tested that dismounted units would be able to operate more effectively when they have rich and up-to-date information available. A virtual gaming environment and a simulated Soldier Digital Assistant (SDA) were developed to this end. The results show that soldiers using the simulated SDA could navigate faster through unknown terrain, experience more efficiency and have a higher situational awareness than soldiers without the SDA. The lessons learned on using virtual game environments for research are discussed.

DTIC

*Combat; Navigation; Simulation; Situational Awareness*

**20080001944** Naval Postgraduate School, Monterey, CA USA

**Alloy Experiments for a Least Privilege Separation Kernel**

Phelps, David A; Jun 2007; 107 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473428; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A least privilege separation kernel (LPSK) is part of a long-term project known as the Trusted Computing Exemplar (TCX). A major objective of the TCX is the creation of an open framework for high assurance development. A relatively new specification tool called Alloy has shown potential for high assurance development. We implemented the formal security policy model (FSPM) and the formal top level specification (FTLS) of the TCX LPSK in Alloy and concluded that Alloy has few limitations and is more than sufficiently useful, as measured by utility and ease of use, to include in the TCX framework.

DTIC

*Computer Programming; Kernel Functions; Security; Software Engineering*

**20080001946** Naval Postgraduate School, Monterey, CA USA

**Innovations for Requirements Engineering**

Luqi.; Martell, Craig; Jan 1, 2008; 205 pp.; In English

Report No.(s): AD-A473430; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the 15 Monterey workshops since 1992 has been to increase the practical impact of the formal methods in computer-aided software development . The workshops seek to improve software practice via the application of engineering theory and to encourage development of engineering theory that is well suited for this purpose. The 2007 workshop focused on requirements, particularly the process of transforming vague and uncoordinated needs of individual stakeholders into consistent and well-defined requirements that are suitable for supporting automated and computeraided methods for

engineering subtasks in the subsequent development process. Innovations are effective technology transfers of sound inventions. The workshop case study was targeted at identification and assessment of sound inventions of technology that can be used to support innovations in requirement engineering. For example, we wanted to gain a better understanding about how to deal with natural language as the vehicle from which we derive system/software requirements, how to use intelligent agents as entities to facilitate semi-automatic requirements-documentation analysis, and how to build automatic systems to aid in requirements/specifications elicitation. The overall aim was to exchange ideas for continued research in the intersection of these two areas and to reduce the gap between theory and practice.

DTIC

*Computer Programming; Computer Programs; Computer Techniques; Requirements; Software Engineering*

**20080001947** Naval Postgraduate School, Monterey, CA USA

### **Rapid Prototyping of Robotic Systems**

Smuda, William J; Jun 2007; 251 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473433; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This effort describes a systems engineering approach to the design and implementation of software for prototyping robotic systems. Developing networked robotic systems of diverse physical assets is a continuing challenge to developers. Problems often multiply when adding new hardware/software artifacts or when reconfiguring existing systems. This work describes a method to create model-based, graphical domain-specific languages. Domain-specific languages use terms understandable to domain engineers as well as abstract software engineering decisions. This methodology enables domain engineers to create quality executable prototypes without being versed in the intricacies of software engineering.

DTIC

*Computer Programs; Rapid Prototyping; Robotics; Standardization*

**20080002202** Naval Academy, Annapolis, MD USA

### **Development of a Fully Interconnected Optical Network Architecture (FIONA)**

Daniel, Mark E; May 7, 2007; 56 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Networks have been rapidly evolving over the last several decades and continue to do so today. This evolution has been driven by a need for increased performance, as characterized by increased data rates and larger bandwidth. This project focused on the development of a reconfigurable network architecture that connects existing Local Area Networks (LANs) to create an extended LAN. The network uses optical fiber and supports data transparency. This Fully Interconnected Optical Network Architecture (FIONA), uses Dense Wavelength Division Multiplexing (DWDM), wavelength conversion and out-of-band control to achieve all-optical routing within the network. The architecture uses all-optical wavelength conversion as both a mechanism to route data and to reconfigure the network in the event of a link failure. A portion of the network was constructed and a simple control algorithm was implemented. Proof of concept testing was completed, demonstrating all-optical routing of data and out-of-band control. The network has demonstrated some ability to handle mixed signal transmission, and its data transparent nature allows for the connection of heterogeneous LANs to form a single extended LAN. The reconfigurability of the network improves survivability and fault tolerance without necessarily adding redundant systems or links. Fiber optics allow for higher data rates and larger available bandwidth compared to existing copper networks. The mixed signal nature of the network eliminates the need for pre-transmission conversion of analog data and enables the interconnection of analog and digital devices. FIONA is an improvement over existing access network architectures, such as those used in shipboard and avionics applications. It provides greater connectivity between local area networks, resulting in increased network performance.

DTIC

*Optical Properties; Computer Networks; Local Area Networks; Architecture (Computers)*

**20080002252** Bevilacqua Research Corp., Huntsville, AL USA

### **Digital Integrated Collection Environment (DICE)/Cognitive Reasoning Engine (CORE) Intelligent Threat Architecture Study**

Detulio, Kenneth; Skipper, David; May 2003; 17 pp.; In English

Contract(s)/Grant(s): DAAH01-00-D-A100/15; Proj-0476

Report No.(s): AD-A473159; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473159>

This report provides a brief explanation of a project whose original objective was to develop an intelligent entity to



enhance the capabilities of the Digital Integrated Air Defense System (DIADS) system. The intent was to develop an overall architecture that would provide basic intelligence and the framework to extend the entities in the future to even greater levels of intelligence. Due to unexpected issues with the use of DIADS, the decision was made to switch the focus of this effort from DIADS to the Digital Integrated Collection Environment (DICE) simulation. From that point, the project was to determine the BRC developed Cognitive Reasoning Engine (CORE) compatibility with the DICE system. This compatibility was accomplished and the final result is that the DICE simulation can accept external control of entities to provide more robust human behavior representation.

DTIC

*Systems Integration; Digital Systems*

**20080002263** NASA Langley Research Center, Hampton, VA, USA

**Toward Scientific Numerical Modeling**

Kleb, Bil; December 03, 2007; 12 pp.; In English; NATO-RTO AVT-147 Symposium on Computational Uncertainty in Military Vehicle, 3-6 Dec. 2007, Athens, Greece; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 599489.02.07.04.03; Copyright; Avail.: CASI: [A03](#), Hardcopy

Ultimately, scientific numerical models need quantified output uncertainties so that modeling can evolve to better match reality. Documenting model input uncertainties and verifying that numerical models are translated into code correctly, however, are necessary first steps toward that goal. Without known input parameter uncertainties, model sensitivities are all one can determine, and without code verification, output uncertainties are simply not reliable. To address these two shortcomings, two proposals are offered: (1) an unobtrusive mechanism to document input parameter uncertainties in situ and (2) an adaptation of the Scientific Method to numerical model development and deployment. Because these two steps require changes in the computational simulation community to bear fruit, they are presented in terms of the Beckhard-Harris-Gleicher change model.

Author

*Mathematical Models; Simulation; Parameter Identification; Software Reliability*

**20080002352** Massachusetts Inst. of Tech., Cambridge, MA USA

**Modeling of Hall Thruster Lifetime and Erosion Mechanisms (Preprint)**

Cheng, Shannon Y; Martinez-Sanchez, Manuel; Sep 2007; 27 pp.; In English

Contract(s)/Grant(s): Proj-33SP

Report No.(s): AD-A473503; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473503>

An axisymmetric hybrid-PIC model of the Hall thruster plasma discharge has been upgraded to simulate the erosion of the thruster acceleration channel, the degradation of which is the main life-limiting factor of the propulsion system. Evolution of the thruster geometry as a result of material removal due to sputtering is modeled by calculating wall erosion rates, stepping the grid boundary by a chosen time step and altering the computational mesh between simulation runs. The code is first tuned to predict the nose cone erosion of a 200 W Busek Hall thruster, the BHT-200. Simulated erosion profiles from the first 500 hours of operation compare favorably to experimental data. The thruster is then subjected to a virtual life test that predicts a lifetime of 1,330 hours, well within the empirically determined range of 1,287-1,519 hours. The model is then applied to the BHT-600, a higher power thruster, to reproduce wear of its exit ring configuration over 932 hours of firing. Though some optimized code features remain the same, others need adjustment to achieve comparable erosion results. Better understanding of the physics of anomalous plasma transport and low-energy sputtering are identified as the most pressing needs for improved lifetime models.

DTIC

*Erosion; Hall Thrusters*

**20080002366** Naval Postgraduate School, Monterey, CA USA

**Effects of the Wireless Channel, Signal Compression and Network Architecture on Speech Quality in Voip Networks**

Nikolaos, Tiantioukas; Jun 2007; 105 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473528; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473528>

Voice over Internet Protocol (VoIP) telephony is an emerging technology slowly finding its way into military applications. It provides several advantages over PSTN but comes short on performance, quality of service and availability. The purpose

of this thesis is to measure the quality of voice in VoIP communications. More specifically it investigates the effects of wireless channel conditions as well as channel coding and compression on the received speech quality. Both simulation and experimentation are conducted using Matlab code and Speex software and across commercial VoIP networks. Simulation shows that fading channel parameters can heavily affect the quality of received speech. Speech compression results in bit rate gain, but, on the other hand, the signal becomes more sensitive to errors. The performance of an outdoor wireless network is better than that of an indoor network. The VoIP network architecture can affect the received speech quality on a long-distance connection.

DTIC

*Internets; Voice Communication; Wireless Communication*

**20080002370** Darcom Packaging Storage and Containerization Center, Tobyhanna, PA USA

**Military Standard: Standard Symbolology for Marking Unit Packs, Outer Containers, and Selected Documents**

Jan 4, 1982; 14 pp.; In English

Report No.(s): AD-A473534; MIL-STD-1189; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473534>

The purpose of this standard is to define the standard DoD symbolology for marking unit packs, outer containers, and selected documents by means of bar coding.

DTIC

*Coding; Symbols*

**20080002430** Naval Postgraduate School, Monterey, CA USA

**System-of-Systems Test Planning in a Complex Joint Environment**

Wegner, Christopher M; Jun 2007; 93 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473637; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473637>

Force Transformation requires a much greater emphasis on testing joint warfighting capabilities. A unique challenge in assessing the effectiveness and suitability of systems in the joint environment is the multitude of possible interactions and outcomes in a system-of-systems construct. Because of resource constraints and the complexity of conducting live, virtual, and constructive testing in a joint mission environment, the Joint Test and Evaluation Methodology (JTEM) program is interested in determining if analytical techniques, like Modeling and Simulation, can be applied to understand the relationship between system-of-systems performance and joint mission effectiveness. As a proof of concept, a Network Enabled Weapon (NEW) was chosen as a framework for this study. This thesis uses an agent-based distillation, which is a type of computer simulation, to model the critical factors of interest in a NEW engagement without explicitly modeling all of the physical details. Using cutting-edge experimental design techniques, the computer model was run many tens of thousands of times, with the results being analyzed to determine the critical parameters required for mission success. The analysis determined key interactions in NEW system performance and provides JTEM with a framework for efficiently conducting testing in a live environment. Specifically, the results indicate sensor range of a third-party ground controller, target speed, NEW impact radius, and weapon accuracy as the key factors affecting system performance.

DTIC

*Computerized Simulation; Evaluation; Simulation; System Effectiveness; Test Facilities; Weapon Systems*

**20080002448** Humansystems, Inc., Guelph, Ontario Canada

**Team Modelling: Survey of Experimental Platforms (Modelisation d'équipes : Examen de plate-formes expérimentales)**

Go, E; Bos, J C; Lamoureux, T M; Sep 2006; 121 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473672; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473672>

Defense Research and Development Canada (DRDC) Toronto is in the process of developing a team research platform aimed at supporting the Canadian Forces (CF) future integrated operations, and interoperability with allies, other government departments (OGDs) and nongovernment organizations (NGOs). A literature review of platforms for team research was conducted to support the Crown in choosing a specific type of team in a specific work context as the focus of team research and team modelling to be conducted in a multi-year Applied Research Project (ARP). The objectives of this report were to identify and characterize different team research platforms in support of military operations (or related applications), review

the different team research platforms in terms of criteria identified by the team literature review; and identify requirements for a new experimental platform that will support experiments that are representative of the targeted teamwork context. In addition, correlations were established with the literature review that was also conducted in the first phase of this project (Sartori, Waldherr and Adams, 2006), to identify areas that are relatively unexplored in both the literature and platform review.

DTIC

*Computerized Simulation; Human Performance; Surveys; Teams*

**20080002449** Humansystems, Inc., Guelph, Ontario Canada

**Team Modelling: Review of Experimental Scenarios and Computational Models**

Lamoureux, T M; Bandali, F; Bruyn Martin, L M; Li, Z; Sep 2006; 176 pp.; In English

Contract(s)/Grant(s): W7711-047911/001/TOR

Report No.(s): AD-A473673; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473673>

Defense Research and Development Canada (DRDC) Toronto is in the process of developing team research scenarios aimed at supporting the Canadian Forces (CF) future integrated operations, and interoperability with allies, other government departments (OGDs) and non-government organizations (NGOs). This work falls within a 4-year Applied Research Project (ARP) to include a literature review of relevant team literature, the creation of a platform for conducting experiments on teams, the running of team experiments using a scenario involving one or more Human Systems Integration (HSI) intervention(s), the development of a computational model of team performance, and some preliminary validation of this model. Previous reports (Sartori, Waldherr and Adams, 2006; Go, Bos and Lamoureux, 2006) have reported the outcomes of exhaustive literature reviews on team research and team research platforms respectively. This report describes the outcomes of two parallel streams of work. The first stream was the development of three team experimental scenarios, in a domestic operational context, appropriate for studying the targeted teamwork factors (i.e. teams-of-teams, joint, interagency, distributed environment). This was done by identifying and reviewing scenarios used previously in team research, leveraging concepts important to team research scenarios identified by the literature review, and incorporating knowledge of future CF requirements in new, composite team research scenarios. The second objective of this report was to evaluate a variety of computational modelling applications for their adequacy in modelling the targeted teams in the targeted scenarios, and to recommend one application as the most suitable. This report provides detail regarding the different scenarios and computational models evaluated, and provides direction for the further development of scenarios to suit the detailed requirements of the ARP.

DTIC

*Computerized Simulation; Human Performance; Mathematical Models; Teams*

**20080002550** Naval Postgraduate School, Monterey, CA USA

**MAJIC: A Java Application for Controlling Multiple, Heterogeneous Robotic Agents**

Ball, Gregory P; Sep 2007; 157 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473693; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Current capability to command and control a team of heterogeneous robotic agents is limited by proprietary command formats and operating systems. A specific challenge in this context is the specification, the programming, and the testing of software for such a wide variety of mobile robot teams. This work explores the applicability of an application program interface (API), called the Multi-Agent Java Interface Controller (MAJIC), that supports command, control, and coordination of heterogeneous robot teams. MAJIC encapsulates scripted commands, preprogrammed behaviors, and simultaneous, multi-agent control. By exploiting the powerful techniques of polymorphism and object-oriented programming, a generic MajicBot class will provide the necessary level of abstraction between the user and the proprietary architectures. Utilizing the technique of inheritance, future NPS students will be able to extend the generic class in order to easily add new robot-specific libraries. Students will also be able to utilize the existing libraries to program and test their own robot behaviors in real-world environments utilizing the MAJIC package. A final display of the versatility and power of programming behaviors within the MAJIC software architecture is demonstrated by a series of example programs conducted on a team of robots consisting of a Sony Aibo, a Mobile Robots Pioneer, and a K-Team Hemisson.

DTIC

*Applications Programs (Computers); Computer Programming; Heterogeneity; Java (Programming Language); Robotics*

**20080002556** Naval Postgraduate School, Monterey, CA USA

**Tri-Level Optimization Models to Defend Critical Infrastructure**

San Martin, Pablo A; Sep 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473701; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis develops and solves a tri-level optimization model to plan the optimal defense of an infrastructure from intelligent attack. We assume that a defender will first use limited defensive resources to protect system s components; then, an intelligent adversary ( attacker ) will use limited offensive resources to attack unprotected components in order to inflict maximum damage to the system. The defender guides system operation with an optimization model, so increased operating cost equates to damage. This leads to a tri-level defender-attackerdefender model (DAD), where the second defender means defender as system operator. The general DAD is NP-hard and requires decomposition to solve. We develop four decomposition algorithms: direct, nested, reformulation-based, and reordering-based. The reordering-based algorithm computes an optimistic bound by reordering the stages of the DAD, and the reformulation-based algorithm uses subproblems that resemble standard capacity-interdiction models. Computational tests on generic instances of defending the shortest path (DSP) show the nested and reformulation-based algorithms to be twice faster than the first, on average. A hypothetical instance of DSP provides a concrete illustration: A Spanish marine unit, in an emergency deployment, must defend its base-to-port route against potential terrorist attacks.

DTIC

*Military Technology; Security*

**20080002558** Naval Postgraduate School, Monterey, CA USA

**Distribution of Information in Ad Hoc Networks**

Hassine, Wijden B; Sep 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473703; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ad-hoc networks are distributed, self-organized networks which do not need a fixed infrastructure. Entities in networks of this sort must collaborate to make network services such as routing - functional. In these environments, many algorithms from wired networks cannot be naively adapted without congesting the network. The author's work is focused on the study of the information distribution protocol. Indeed, without application, ad-hoc network technologies are useless. Managing services consists of providing a reliable and easy way to develop distributed applications. This work contributes to this study in two specific ways. First, it provides a mathematical model that deals with the best possible site of information source nodes in a graph of infinite density. Thus, nodes can be laid out where desired. Second, it provides an algorithm which achieves an effective distribution of information among the nodes of the network. This algorithm can then be used to publish the description of a service among the network to make its research easy. This study's results provide a settlement for the design of a distributed of information in ad-hoc networks. Moreover, the results can be used in other application fields such as QoS multi-path routing.

DTIC

*Computer Networks; Information Systems*

**20080002600** Massachusetts Inst. of Tech., Cambridge, MA USA

**An Integrated Architecture for Grounded Intelligence in Its Development, Experimental, Environmental, and Social Context**

Breazeal, Cynthia; Barsalou, Larry; Smith, Linda; May 2007; 25 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-7255; Proj-DRPA

Report No.(s): AD-A473768; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report describes a novel biologically-inspired cognitive architecture. The systems level architecture described in this report was inspired by Simmons and Barsalou (2003), with psychologically-inspired additions proposed by Breazeal et al (2005), augmented by key insights from developmental psychology (Smith, 2005). A cognitive agent will have multiple modality-specific systems, including sensory systems (e.g., vision, audition, touch), a motor system, an emotional system, and a cognitive system. As a system perceives its external world and internal mental states, feature systems will represent these experiences in the relevant perceptual modalities, and a hierarchical system of neurally-inspired association areas will capture them, so that they can be reenacted or simulated in the future. These perceptually grounded representations guide the intelligent and social operations of agents.

DTIC

*Artificial Intelligence; Intelligence; Prototypes*

**20080002623** Naval Postgraduate School, Monterey, CA USA

**Cost Estimation of Post Production Software Support in Ground Combat Systems**

Cannon, Christopher J; Sep 2007; 91 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473799; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Weapon systems and programs are becoming increasingly more dependent on software as a critical technology for the success of the programs. Along with this dependence on performance, the costs associated with software are becoming an increasing share of the life cycle costs of these weapon systems and programs. Life cycle software costs are divided into two phases, development and maintenance. There are numerous popular models to aid developers and independent estimators in predicting costs and schedules for software development. Some of these models are open source, many others are proprietary. These models are based on research performed on existing software systems and historical data. However, for software maintenance, there are far fewer models, research efforts, or collected data sets. The Army's term for software maintenance is post production software support. This thesis describes how this support is currently funded, performed, and estimated. The model presented could be adopted to manage support of Army ground combat systems. This thesis further the understanding of the software maintenance support costs associated with weapon systems. In addition to specific results on ground combat systems presented, the thesis provides insight into maintaining other large software-dependent systems and recommendations on further research in the field.

DTIC

*Combat; Computer Programming; Cost Estimates; Life Cycle Costs; Software Engineering; Support Systems; Warfare; Weapon Systems*

**20080002656** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Free LittleDog!: Towards Completely Untethered Operation of the LittleDog Quadruped**

Dille, Michael N; Aug 2007; 67 pp.; In English

Report No.(s): AD-A473861; CMU-CS-07-148; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The LittleDog robot is a 12 degree-of-freedom quadruped developed by Boston Dynamics and selected for use in the DARPA Learning Locomotion program, in which machine learning is applied to develop controllers capable of navigating rocky terrain. Presently, it is typically constrained to operate within wireless range of a host desktop computer and within a fixed workspace surrounded by a motion capture system that globally localizes the robot and specially marked terrain boards without the use of onboard sensing. In this thesis, we explore a variety of strategies for expanding the capabilities of this platform in the theme of relaxing these operational constraints and with the goal of allowing operation in arbitrary locations outside of the fixed workspace and without a host computer. Towards this end, we start by addressing the straightforward technical issue of physical independence by demonstrating a viable onboard controller in the form of a compact single-board computer. Next, we attempt to resolve the lack of onboard sensing through computer vision by attaching a camera to the robot and developing the necessary procedures for calibrating it, synchronizing its data stream with existing state data, and compensating for the additional weight of the camera. Using this, we demonstrate mapping and navigation of terrains outside the motion capture system containing both planar and simple structured three-dimensional obstacles. In conjunction with this, we develop and implement several dead reckoning strategies, one including a complete kinodynamic model of ground contact, to compute odometry information enabling reasonably accurate continuous pose estimation. Finally, we complete a brief exploration of alternatives for local sensing and reason about extensions to more unstructured environments.

DTIC

*Autonomous Navigation; Robots*

**20080002661** Army Engineer Research and Development Center, Vicksburg, MS USA

**Regional Morphology Analysis Package (RMAP): Empirical Orthogonal Function Analysis, Background and Examples**

Connell, Kenneth J; Larson, Magnus; Oct 2007; 22 pp.; In English

Report No.(s): AD-A473878; ERDC-TN-SWWRP-07-9; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This System-Wide Water Resources Program (SWWRP) technical note describes software for analyzing beach profile and shoreline position data by means of Empirical Orthogonal Functions (EOFs). Patterns obtained through EOF analysis can often be related to the physical processes shaping the beach morphology and extend understanding of how the morphology responds to changes in the forcing (e.g. wave and water level conditions) or to anthropogenic activities (e.g., beach nourishment, coastal structures). EOF analysis capability was added to the Regional Morphology Analysis Package (RMAP). After review of the theory and literature, the EOF method is applied to three examples that encompass (1) beach profiles measured through time

at a specific location, (2) beach profiles surveyed at various alongshore locations at a specific time, and (3) shorelines measured at different times.

DTIC

*Computer Programs; Functional Analysis; Functions (Mathematics); Morphology; Orthogonal Functions; Sediment Transport*

**20080002662** Naval Postgraduate School, Monterey, CA USA

**XML Tactical Chat (XTC): The Way Ahead for Navy Chat**

DeVos, Dan; Sep 2007; 187 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473882; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The motivation for pursuing XML-based tactical chat includes the great potential of this technology and fixing limitations of current chat programs. XTC capabilities have the potential to completely upgrade and restructure all tactical military communications. The current tools for military chat include IRC, Yahoo, MSN, AIM, ICQ, and NKO. None of these provides the full functionality or interoperability needed in a joint environment. Moreover, if a nonproprietary chat protocol is developed, it can lead to a decision-support environment in which data, text, audio, and video can be logged, evaluated and managed, all in a Web environment where no additional specialized software or hardware is needed. Chat technology challenges for the military fit into three areas: tactical, technical, and administrative. Tactically, there are many ways chat can be used, but effective practices are not yet defined in procedures or doctrine. Joint forces use a myriad of chat programs that don't interoperate and are usually proprietary. Technically, many chat programs are barred by firewalls and lack a robust interface to allow logging and searching past chats. From an administrative perspective, plain-text chat has no structure. Scheduling and controlling who attends or converses remains undefined. Within DoD there is no standard for how, when, and by whom chats ought to be conducted. Possible approaches to these problems include adopting a proprietary chat system or customizing an open-source implementation. Proprietary solutions are costly, do not interoperate well, and are too inflexible for a technology that is evolving rapidly. Open-source software can provide a solution that is adaptable, extensible, quick to implement, straightforward to maintain, and relatively inexpensive. This thesis provides a preliminary assessment of XML-based tactical chat (XTC) using an opensource, open-standards solution.

DTIC

*Computer Programs; Document Markup Languages; Navy; Programming Languages; Telecommunication*

**20080002812** Air Force Research Lab., Wright-Patterson AFB, OH USA

**A Detailed Investigation of Bluff Body Stabilized Flames (Postprint)**

Kiel, Barry; Garwick, Kyle; Gord, James R; Miller, Joseph; Lynch, Amy; Aug 2007; 12 pp.; In English

Contract(s)/Grant(s): Proj-3066

Report No.(s): AD-A473740; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Reduced Order Models (ROMs) and Computational Fluid Dynamics (CFD) codes are tools used to predict the extinction of flames behind bluff bodies. Accurate prediction of these models and codes is predicated on their validation with experimental data. This paper describes detailed experiments to obtain validation data for bluff body stabilized flames over a wide range of conditions. Included are non-reacting data from CFD and LDV, lean blowout and high speed images for three different flame holders. In our previous paper (Kiel 2006) it was asserted that the large vortices were a major driver of extinction. Those assertions are further supported here. It is concluded that the vortex dynamics and not geometry is the dominant mechanism for bluff body flame extinction. This conclusion is supported by the lean blowout data, by the high speed images and reference data from NACA.

DTIC

*Bluff Bodies; Combustion Chambers; Flames; Large Eddy Simulation*

**20080002813** Naval Research Lab., Washington, DC USA

**The Protections of Bilaterally Sensitive Information on a Restricted Multilateral Network**

Kang, Myong; Pieper, Steven; Smith, Jeremy; Yeh, Allen; Oct 19, 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473751; NRL/MR/5542--07-9084; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Historically, fully separate technical implementation was required for each bilateral information exchange, which is largely supported by the U.S. in terms of facilities, manpower, and infrastructure at substantial cost. In this report, we propose

a solution that will allow the U.S. to consolidate some of these networks while assuring that information will be treated with the appropriate degree of confidentiality.

DTIC

*Computer Networks; Sensitivity*

**20080012293** California Inst. of Tech., Pasadena, CA USA

**Method and apparatus for implementing a traceback maximum-likelihood decoder in a hypercube network**

Pollara-Bozzola, Fabrizio, Inventor; September 19, 1989; 18 pp.; In English

Patent Info.: Filed August 18, 1987; US-PATENT-4,868,830; US-PATENT-APPL-SN-086710; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012293>

A method and a structure to implement maximum-likelihood decoding of convolutional codes on a network of microprocessors interconnected as an n-dimensional cube (hypercube). By proper reordering of states in the decoder, only communication between adjacent processors is required. Communication time is limited to that required for communication only of the accumulated metrics and not the survivor parameters of a Viterbi decoding algorithm. The survivor parameters are stored at a local processor's memory and a trace-back method is employed to ascertain the decoding result. Faster and more efficient operation is enabled, and decoding of large constraint length codes is feasible using standard VLSI technology.

Official Gazette of the U.S. Patent and Trademark Office

*Decoders; Hypercube Multiprocessors; Maximum Likelihood Estimates; Microprocessors*

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### COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

**2008000544** Department of Defense, Arlington, VA USA

**Defense Information Systems Agency Controls Over the Center for Computing Services**

Granetto, Paul J; Marsh, Patricia A; Remington, Patricia C; Sonsini, Frank C; Luecke, Suzette L; Tran, Anh H; Davitt, Michael L; Lee-Baynard, Chanda D; Olberding, Danial J; Lam, Chi H; Apr 9, 2007; 68 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000FG-0053.001

Report No.(s): AD-A472297; IG/DOD-D-2007-082; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The DoD Office of Inspector General is implementing a long-range strategy to conduct audits of DoD financial statements to comply with the Chief Financial Officers Act of 1990 (Public Law 101-576), as amended, which requires agencies to prepare and submit to Congress audited financial statements. As part of this effort, we performed a Statement on Auditing Standards No. 70 audit of CS in accordance with generally accepted government auditing standards and the American Institute of Certified Public Accountants standards. CS provides computer processing for the entire range of combat support functions, including transportation, logistics, maintenance, munitions, engineering, acquisition, finance, medicine, and military personnel readiness. With more than 800,000 users, CS provides support for over 1,400 applications in 18 geographically separate facilities. The reliability of general computer controls directly impacts individual financial and accounting systems and feeder systems, and, ultimately, could impact the ability of DoD to produce reliable and auditable financial statements.

DTIC

*Computer Networks; Financial Management; Information Systems*

**2008000646** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

**High-Capacity Ground Communications to Support Future Space Missions: A Forecast of Ground Communications Challenges in the 2010-2020 Period**

Markley, Richard W.; July 16, 2003; 14 pp.; In English; Space Mission Challenges for Information Technology Symposium, 13 Jul. 2003, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40552>

The purpose of this presentation is to identify major challenges involved in space ground communications networks to support space flight missions over the next 20 years. The presentation focus is on the Deep Space Network and its customers,

but the forecast is applicable to all space ground communications networks.

Derived from text

*Deep Space Network; Space Missions; Ground-Air-Ground Communication; Space Communication; Protocol (Computers)*

**2008000801** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**A Framework For Analyzing And Mitigating The Vulnerabilities Of Complex Systems Via Attack And Protection Trees**

Edge, Kenneth S; Jul 2007; 219 pp.; In English

Contract(s)/Grant(s): Proj-ENR-07-152

Report No.(s): AD-A472310; AFIT/DS/ENG/07-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Attack trees have been developed to describe processes by which malicious users attempt to exploit or break complex systems. Attack trees offer a method of decomposing, visualizing, and determining the cost or likelihood of attacks. Attack trees by themselves do not provide enough decision support to system defenders. This research develops the concept of using protection trees to offer a detailed risk analysis of a system. In addition to developing protection trees, this research improves the existing concept of attack trees and develops rule sets for the manipulation of metrics used in the security of complex systems. This research specifically develops the framework for using an attack and protection tree methodology to analyze the security of complex systems. The structure of attack trees is extended and modified to create protection trees. To validate the effectiveness of the methodology, the Schematic Protection Model (SPM) is used. The SPM is extended and applied to verify that a system protected using the attack and protection tree methodology is safe. To demonstrate the general usefulness of this novel methodology, it is used to analyze the security of several varied domains including computer networks, online banking, homeland security, and mobile ad hoc networks.

DTIC

*Complex Systems; Computer Information Security; Computer Networks; Protection; Risk; Vulnerability*

**2008000940** National Dong Hwa Univ., Hualien, Taiwan, Province of China

**A Label-Based Information Flow Control Model for Object-Oriented Systems**

Chou, Shih-Chien; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 323-330; In English; See also [2008000927](#); Copyright; Avail.: Other Sources

This paper proposes a label-based information flow control model to prevent information leakage within object-oriented systems. It offers the features of: (a) adapting to dynamic object state change, (b) adapting to dynamic role change, (c) preventing indirect information leakage, (d) detailing the control granularity to variables. (e) allowing purpose-oriented method invocation, (f) controlling method invocation through argument sensitivity, (g) allowing declassification, and (h) allowing only trusted sources to write a variable.

Author

*Information Flow; Object-Oriented Programming; Computer Information Security*

**2008001040** Naval Postgraduate School, Monterey, CA USA

**Architecting Joint Command and Control System of System Capability Certifications**

Acosta, Jacob; Hoesly, Scot; Huseh, Scott; Krider, Steven; Lamb, Jeremy; Martin, Calvin; Medina, Vince; Medina, Jorge; Nguyen, Michael; Patel, Jaykant; Sep 2007; 247 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472716; NPS-SE-07-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472716>

Command, Control, Communications, Computers, and Intelligence (C4I) systems, each originally designed to address a single warfighting function, have been assembled into an interdependent C4I System of Systems (SoS). The C4I SoS continues to evolve, without overarching capabilities-based performance requirements. Without requirements, there is no practical, repeatable, and objective process to assess changes to the SoS. This project applied a disciplined systems engineering process to design a Joint C4I Capability Certification Measures (JC3M) system. JC3M can be used to define performance measures for a C4I SoS, determine baseline SoS performance, assess proposed SoS changes, and monitor SoS performance. Modeling and simulation tools were used to project the performance of three existing alternatives and two new alternatives. A Life Cycle Cost Estimate (LCCE) was generated for each alternative. An Analysis of Alternatives compared performance and cost. The Joint Test and Evaluation Methodology Capability Test Methodology (JTEM CTM) was projected to provide slightly better performance than other alternatives, at the median LCCE. The results were a recommendation to monitor JTEM CTM as it



completes development, and employ the JTEM CTM in a C4I SoS evaluation to confirm its estimated cost and performance.  
DTIC

*Command and Control; Systems Engineering*

**20080001680** Arizona State Univ., Tempe, AZ USA

**CIP: A Complex Adaptive System Approach to QoS Assurance and Stateful Resource Management for Dependable Information Infrastructure**

Ye, Nong; Lai, Ying-Cheng; Aug 31, 2005; 16 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0317

Report No.(s): AD-A473161; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473161>

This research relates to the project objectives concerning information infrastructure at the local, regional and global levels. The subgroup's major effort in the past year was on theoretical and computational issues concerning the structure, dynamics, optimization, information flow, and security in complex networks. The investigations directly relate to our original goals stated in previous years' reports. The benefits applications of this network extend from small, local area networks, to large information infrastructures. Such networks may be governmental or civilian in nature. Critical government and civilian network operations can both benefit from having network QoS guarantees. This year, we extended our local level quality of service (QoS) work on waiting time variance (WTV) problems and developed heuristic methods for weighted WTV problems. We drew some conclusions regarding the influencing factors of extended our local level QoS work to multiple machine problems. We completed investigating the case where the multiple machines are identical and developed methods for scheduling jobs on these machines. At the global level, we developed a protocol and algorithms for end-to-end QoS and began implanting a simulation to explore our protocol.

DTIC

*Complex Systems; Information Management; Local Area Networks; Management Information Systems; Resources Management; Security*

**20080001837** NASA Dryden Flight Research Center, Edwards, CA, USA

**Design of a Mission Data Storage and Retrieval System for NASA Dryden Flight Research Center**

Lux, Jessica; Downing, Bob; Sheldon, Jack; December 2007; 14 pp.; In English; 43rd Annual International Telemetry Conference (ITC) and Technical Exhibition 2007, 22-25 Oct. 2007, Las Vegas, NV, USA; Original contains black and white illustrations

Report No.(s): NASA/TM-2007-214631; H-2790; ITC-07-1062; Copyright; Avail.: CASI: [A03](#), Hardcopy

The Western Aeronautical Test Range (WATR) at the NASA Dryden Flight Research Center (DFRC) employs the WATR Integrated Next Generation System (WINGS) for the processing and display of aeronautical flight data. This report discusses the post-mission segment of the WINGS architecture. A team designed and implemented a system for the near- and long-term storage and distribution of mission data for flight projects at DFRC, providing the user with intelligent access to data. Discussed are the legacy system, an industry survey, system operational concept, high-level system features, and initial design efforts.

Author

*Data Storage; Test Ranges; Systems Integration; Flight Tests*

**20080001838** L-3 Communications Corp., Newburyport, MA USA

**Intelligent Advanced Communications IP Telephony Feasibility for the U.S. Navy. Volume 1**

Binns, Todd D; Naas, Bill; Oct 2007; 456 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-C-0062

Report No.(s): AD-A473253; L3COM/HENSCHEL/TR--2007/001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this research paper is to research technologies and solutions supporting the communications infrastructure necessary to implement an integrated VoIP (IP telephony), Video and Data infrastructure on U.S. Naval vessels. This report is based on a collection of extensive research topics: \* L3 Henschel internal research \* Commissioned research papers \* Vendor responses to a formal questionnaire \* U.S. Navy vessel specifications \* Government documents focusing on network security and implementation. Major findings for implementing an integrated VoIP (IP telephony), Video and Data infrastructure on Naval vessels: \* The technology is becoming pervasive within the commercial market sector. \* Implementing

an IP solution on U.S. Navy vessels is feasible and achievable. \* Due to the unique requirements of the U.S. Navy, there is a staged implementation planned from feasibility to proof-of-concept (FY08 phase 2), followed by evaluation in a Navy lab and Navy ship (FY09 phase 3). \* Benefits of an integrated VoIP (IP telephony), Video and Data infrastructure are space and weight savings of 50% and cost savings of 25% with additional features and functionality. \* There will continue to be major investments in this infrastructure under an Open Systems Architecture consortium, thus enabling wide availability of COT's products. \* The integration of VoIP (IP telephony), Video and Data will be secure as detailed by Bell Labs and Defense agency publications.

DTIC

*Communication Networks; Feasibility; Internets; Navy; Telephony; Voice Communication*

**20080001840** Naval Postgraduate School, Monterey, CA USA

**Feasibility Study and Cost Benefit Analysis of Thin-Client Computer System Implementation Onboard USA Navy Ships**

Arbulu, Timothy D; Vosberg, Brian J; Jun 2007; 109 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473257; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this MBA project was to conduct a feasibility study and a cost benefit analysis of using thin-client computer systems instead of traditional networks onboard USA Navy ships. The project examined the technical capabilities of thin-client computer systems to ensure they will operate with the required shipboard software and in a shipboard environment. A cost benefit analysis was also conducted to identify the possible cost savings to the Navy through the shipboard use of thin-client computer systems. The results of this analysis showed that thin-client computer networks are a cost-effective, long-term network solution for use onboard USA Navy ships. Because of the incompatibility of some current shipboard software and software systems with thin-clients, a thin-client network including a small number of personal computer workstations may be required until the software is made compatible.

DTIC

*Client Server Systems; Cost Analysis; Cost Effectiveness; Feasibility; Navy; United States*

**20080001928** Naval Postgraduate School, Monterey, CA USA

**Extending the Range of the 802.11g WLAN through Improved Synchronization Techniques**

Sardana, Vikram; Jun 2007; 151 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473390; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Orthogonal Frequency Division Multiplexing (OFDM) allows for a spectrally efficient means of obtaining high data rates while simultaneously combating the effects of fading. The multi-carrier spectrum of OFDM mandates that the receiver accomplish a number of synchronization tasks to successfully demodulate the OFDM signal, including the critical requirement to synchronize the carrier frequency. Additional synchronization tasks include frame synchronization (packet detection), synchronization of the carrier phase, and symbol timing. Improved receiver synchronization algorithms may hold the prospect of superior performance, specifically allowing successful demodulation by the receiver at an extended range. This thesis discusses several promising synchronization algorithms. Furthermore, a performance analysis of these algorithms is conducted at low signal to noise ratio (SNR) in an AWGN channel using MATLAB.

DTIC

*Frequency Division Multiplexing; Local Area Networks; Synchronism; Wireless Communication*

**20080001939** Naval Postgraduate School, Monterey, CA USA

**PC104 Control Environment Development and Use for Testing the Dynamic Accuracy of the MicroStrain 3DM-GX1 Sensor**

Shaver, Jonathan; Jun 2007; 133 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473422; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There is a need for a standard, accurate test bench for inertia-based orientation sensors. Static accuracy testing of these sensors is straightforward but dynamic accuracy testing is more difficult. A test bench system is developed with encoders and a PC104 computer under the QNX Neutrino real-time operating system. A MicroStrain 3DMGX1 inertial sensor was used as the sensor to be tested. The dynamic error of this sensor was accurately recorded and found to be a function of the sensor velocity and acceleration.

DTIC

*Dynamic Tests; Performance Tests; Security; Test Equipment*

**20080001945** Naval Postgraduate School, Monterey, CA USA

**Mapping Autonomous System's Router Level Topology in IPv6**

Poulin, Robert J; Jun 2007; 419 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473429; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The core of the Internet is composed of many independent and mutually exclusive collections of routers, called Autonomous Systems, which are responsible for moving traffic between communicating end-systems, or hosts, regardless of the relative location of those hosts. The complexity of the internal composition of these autonomous systems is such that accurate documentation of their topology, reference to as mapping, is difficult and prone to error. Developing automated support for this effort remains an area of active research, the potential benefit of which is the ability to actively monitor the health of the Internet across these autonomous systems making it possible to identify critical infrastructure chokepoints before their failure adversely impacts the network or national security. The Internet is in the process of transitioning to a new version of the Internet Protocol, the fundamental protocol that melds the heterogeneous networks worldwide into a single cooperative whole. Tools, techniques, and tactics developed for the current version, IPv4, may hold promise for adaptation to support the new version, IPv6. This thesis explores several of the IPv4 techniques that hold promise for adaptation and provides an implementation as a proof-of-concept.

DTIC

*Autonomy; Protocol (Computers); Topology*

**20080002120** Pattern Analysis and Recognition Corp., Rome, NY USA

**Countering Insider Threats - Handling Insider Threats Using Dynamic, Run-Time Forensics**

Hallahan, Jason; Oct 2007; 80 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-C-0072; Proj-231G

Report No.(s): AD-A473440; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary objective of this project was to research and develop applied computer forensic approaches for preventing and detecting insider threats in sensitive organizations in conjunction with advanced access control systems such as Fine-grained, Active, and Scalable Access Control (FASAC). Access Control is the fundamental basis of computer security, but still remains a relative weakness in dealing with everyday threats, especially those posed by insiders. To address the insider threats against critical information systems, an advanced access control approach was investigated that supports fine-grained, active, and scalable access control services.

DTIC

*Access Control; Numerical Control*

**20080002137** National Defense Univ., Washington, DC USA

**The NMCI Experience and Lessons Learned. The Consolidation of Networks by Outsourcing**

Jordan, Kenneth; Jan 2007; 16 pp.; In English

Report No.(s): AD-A473186; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473186>

The Navy/Marine Corps Intranet (NMCI) has been an initiative to provide a single, secure, enterprise-wide network to support the naval shore establishment and tie it to the forces at sea by interfacing with the at-sea network. The plan has been to link 360,000 desktops into one seamless and secure intranet, sharing voice, video, and data services. It is an \$8.8B performance-based services contract with Electronic Data Systems (EDS), initially awarded in October 2000. The scale of NMCI as an information network is second only to the internet itself clearly an enormous effort. NMCI has replaced the fractionated legacy networks of the Navy and Marines with a secure, single, shore-based network. Since its inception, however, the program has been beset with problems. Delays in the fielding of the network have resulted in substantial financial losses for EDS. Customer satisfaction, upon which payments to the contractor depend, has not been uniformly high. Operational users feel that the centralized support approach provides them with less than satisfactory responsiveness in resolving network issues in support of operational situations. The main question is does this network provide sufficient performance to support the net-centric operational needs of the Navy and Marine Corps? In this case study, we will investigate these issues and provide some lessons learned to support the future evolution of NMCI as well as other military networks.

DTIC

*Computer Networks; Consolidation; Navy; Procurement*

**20080002199** Naval Postgraduate School, Monterey, CA USA

**A New Sufficient Condition for Robust Interdomain Routing**

Rogers, John H; Jun 2007; 89 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473414; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Border Gateway Protocol (BGP) is currently the only interdomain routing protocol employed on the internet. It allows tens of thousands of Autonomous Systems (ASes) to exchange routing information while implementing economic and organizational policies. However, conflicting policies between ASes can cause routing instability and/or unpredictable routing solutions. A system of routers is robust if routing tables always converge predictably, despite router and link failures. We pursue an approach to guarantee BGP robustness through operational guidelines. Existing guidelines for BGP robustness are essentially geared toward satisfying the same sufficient condition for BGP robustness developed by Griffin and Wilfong. In this thesis, we first show that there exists a weaker sufficient condition for BGP robustness. We then discuss how new guidelines for configuring BGP with a guarantee of robustness may be derived from this new condition. Additionally, we compare various models of BGP behavior and show that the models do not always have equivalent results and sometimes have completely different behavior.

DTIC

*Protocol (Computers); Computer Systems Programs*

**20080002419** Naval Postgraduate School, Monterey, CA USA

**Preliminary Analysis of a Trusted Platform Module (TPM) Initialization Process**

Wiese, Brian; Jun 2007; 153 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473614; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473614>

As distributed system architectures such as peer-to-peer, grid computing and MANET become more popular, there is an increasing need for robust and scalable mechanisms to establish trust between entities. The Trusted Platform Module (TPM), provides for the possibility to establish trust at the hardware level for commercial hardware. While work has been done to leverage TPMs for Digital Rights Management (DRM) and other schemes, application of TPMs for robust identification and authentication in a MANET or other distributed environment have not been addressed. This research provides a simple analysis on the applicability of leveraging TPMs for enhanced computer security in today's military environment. A military convoy using laptops in a MANET is used as a hypothetical concept of operations. The problem of TPM initialization of a laptop, in particular, at a depot prior to deployment is addressed. The initialization steps that must be performed before using a TPM in any deployment have been studied and described, and suggestions are provided to address possible DoD concerns in using this technology.

DTIC

*Cryptography; Security*

**20080002439** Office of the Under Secretary of Defense (Acquisitions and Technology), Washington, DC USA

**Report of the Defense Science Board Task Force on Mission Impact of Foreign Influence on DoD Software**

Sep 2007; 113 pp.; In English

Report No.(s): AD-A473661; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473661>

The Defense Science Board (DSB) Task Force on Mission Impact of Foreign Influence on DoD Software examined areas in software security, security architecture, and risk mitigation and received briefings from industry, academia, and a number of Defense agencies. Briefings on software assurance and development processes for Defense programs were also provided. The Department's dependence on software, which is growing in size and complexity, presents tempting opportunities for U.S. adversaries to exploit. Further, the increasing interconnectedness of defense systems could lead to the exploitation of many applications through a single vulnerability. The weaknesses, among others, are significant liabilities to the Department's mission-critical systems; however, DoD cannot ignore the economic advantage of globally-produced, commercial-off-the-shelf software. The globalization trend of the software industry will continue to occur, and some of DoD's software will be developed in foreign countries. The task force found that low-level, malicious techniques have been employed to successfully penetrate sensitive, unclassified DoD systems despite efforts by DoD to maintain information security and assurance. DoD's current evaluation strategies and techniques are inadequate to deal with the growing functionality and outsourcing trend of software, making exploitation easier and defense more difficult. The problem is complex, and ultimately, an intelligent risk management process will be essential to ensure a trusted supply chain, mitigate malicious attacks, enable efficient responses and reactions. and maintain trustworthiness in the software that support DoD's critical missions. The task force outlined 11

recommendations in this report. The recommendations aim to improve the trustworthiness of DoD's software supply and address areas in procurement, intelligence, quality and security assurance, acquisition, research and development, and the National agenda.

DTIC

*Computer Programs; Procurement; Security*

**20080002541** Biometric, Clarksburg, WV USA

**Electronic Biometric Transmission Specification. Version 1.2**

Nov 8, 2006; 79 pp.; In English

Report No.(s): AD-A473682; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This DoD Electronic Biometric Transmission Specification (EBTS) describes customizations of the Federal Bureau of Investigation (FBI) Electronic Fingerprint Transmission Specification (EFTS) transactions that are necessary to utilize the Department of Defense (DoD) Automated Biometric Identification System (ABIS).

DTIC

*Biometrics; Data Bases*

**20080012294** California Inst. of Tech., Pasadena, CA USA

**Architecture for time or transform domain decoding of reed-solomon codes**

Shao, Howard M., Inventor; Truong, Trieu-Kie, Inventor; Hsu, In-Shek, Inventor; Deutsch, Leslie J., Inventor; September 19, 1989; 24 pp.; In English

Patent Info.: Filed October 5, 1987; US-PATENT-4,868,828; US-PATENT-APPL-SN-105101; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012294>

Two pipeline (255,233) RS decoders, one a time domain decoder and the other a transform domain decoder, use the same first part to develop an errata locator polynomial  $\tau(x)$ , and an errata evaluator polynomial  $A(x)$ . Both the time domain decoder and transform domain decoder have a modified GCD that uses an input multiplexer and an output demultiplexer to reduce the number of GCD cells required. The time domain decoder uses a Chien search and polynomial evaluator on the GCD outputs  $\tau(x)$  and  $A(x)$ , for the final decoding steps, while the transform domain decoder uses a transform error pattern algorithm operating on  $\tau(x)$  and the initial syndrome computation  $S(x)$ , followed by an inverse transform algorithm in sequence for the final decoding steps prior to adding the received RS coded message to produce a decoded output message.

Official Gazette of the U.S. Patent and Trademark Office

*Decoding; Reed-Solomon Codes; Architecture (Computers)*

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**CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS**

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

**20080000361** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Overview of Army Robotic Convey Technology Programs - Robobusiness 2007**

Teems, Justin; May 15, 2007; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472144; TARDEC-17098; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472144>

DoD Logistics and Convoy Challenges: Effectively utilize existing automation to enhance soldier performance/reduce threat exposure, increase OPTEMPO while conducting the 3Ds: Dull, Dirty, or Dangerous.

DTIC

*Autonomous Navigation; Robotics; Trucks*

**20080000406** Slovak Technical Univ., Bratislava, Czechoslovakia

**Sensor Integration and Context Detection in Intelligent Systems**

Vitko, Anton; Savel, Michal; Kameniar, Dusan; Ladislav, Jurisica; May 2005; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472239; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472239>

No abstract available

*Detection; Multisensor Fusion*

**20080000631** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Object Recognition via Information-Theoretic Measures/Metrics**

Repperger, Daniel W; Pinkus, Alan R; Skipper, Julie A; Schrider, Christian D; Dec 2006; 14 pp.; In English

Contract(s)/Grant(s): Proj-2313

Report No.(s): AD-A472482; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Discrimination of friendly or hostile objects is investigated using information-theory measures/metric in an image which has been compromised by a number of factors. In aerial military images, objects with different orientation can be reasonably approximated by a single identification signature consisting of the average histogram of the object under rotations. Three different information-theoretic measures/metrics are studied as possible criteria to help classify the objects.

DTIC

*Classifications; Information Theory; Pattern Recognition*

**20080000814** Army Research Inst., Orlando, FL USA

**PACERS: Platoon Aid for Collective Employment of Robotic Systems**

Durlach, Paula J; Aug 2007; 48 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-A790

Report No.(s): AD-A472135; RESEARCH REPORT-1876; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472135>

This report presents guidance to help train platoons equipped with organic unmanned systems. The Army currently is supplying platoons with both prototype and commercially available unmanned systems to evaluate military utility and to develop tactics, techniques, and procedures; however, the training provided prior to these experiments focuses almost entirely on individual operator training. While different unmanned systems require different detailed procedures, there are certain aspects of operation applicable across systems, and training could be given on these system-general aspects of employment. The purpose of this report is to (1) lay out these system-general aspects and (2) suggest a list of activities to focus on to help train system integration. Each activity has associated observations and related after-action review questions applicable to both air and ground assets, and avoiding the particulars of any specific system. Trainers will not have the opportunity to become conversant with the specifics of the myriad of systems they may encounter. Besides being system general, the training guidance provided is also mission-general. It suggests appropriate observations and questions to facilitate coaching and after action review discussion specifically with respect to system employment. Therefore, these represent an addition to, not a replacement of, mission-specific observations and after-action review topics.

DTIC

*Education; Organizations; Robotics*

**20080001045** Capraro Technologies, Inc., Utica, NY USA

**Fundamentals of Knowledge-Based Techniques**

Capraro, Gerard T; Sep 1, 2006; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472727; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472727>

No abstract available

*Data Processing; Knowledge Based Systems; Organizations; Radar; Signal Processing; World Wide Web*

**20080001059** University Coll., London, UK

**Impact of Knowledge-Based Techniques on Emerging Technologies**

Griffiths, H D; Sep 1, 2006; 29 pp.; In English

Report No.(s): AD-A472758; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472758>

No abstract available

*Knowledge Based Systems; Multistatic Radar; Phased Arrays; Signal Processing; Synthetic Aperture Radar*

**20080001061** Capraro Technologies, Inc., Utica, NY USA

**Integrated End-to -End Radar Signal & Data Processing With Over-arching Knowledge-Based Control**

Capraro, Gerard T; Sep 1, 2006; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472760; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472760>

No abstract available

*Airborne Radar; Arches; Data Processing; Knowledge Based Systems; Radar Data; Search Radar; Signal Processing*

**20080001184** SELEX Sistemi Interati S.p.A, Rome, Italy

**Introduction to Radar Signal and Data Processing: The Opportunity**

Farina, A; Sep 2006; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472912; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Data Processing; Radar; Radar Data; Signal Processing*

**20080001187** SELEX Sistemi Interati S.p.A, Rome, Italy

**Application of Knowledge-Based Techniques to Tracking Function**

Farina, A; Sep 2006; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472918; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Knowledge Based Systems; Moving Target Indicators; Radar Tracking*

**20080001233** Defence Research and Development Canada, Toronto, Ontario Canada

**Perspectives on Retaining a DRDC Human Sciences Centre...in Toronto**

Jacobs, Ira; Aug 2006; 17 pp.; In English

Report No.(s): AD-A473004; DRDC-T-TM-2006-199; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Defence R&D Canada (DRDC) is embarking on a central initiative to develop a comprehensive infrastructure strategy. A major objective of the initiative is to identify and justify the infrastructure required by DRDC to ensure that it remains a world leader in its Science & Technology activities. The strategy will include addressing issues such as the location of the research centres and the associated synergy that exists with industry and academia in the various research centre locations. The initial stage of this initiative involves collecting perspectives from each of the DRDC research centres. This document is a summary of the related DRDC Toronto managers perspectives. Two main issues are addressed in the document: the importance of retention of a centralized (rather than distributed) human sciences capability by DRDC; and, considerations related to the location in Toronto.

DTIC

*Canada; Research Management*

**20080001525** Office National d'Etudes et de Recherches Aerospatiales, Palaiseau, France

**Understanding Radar Phenomenology of Relocatable Targets**

Chanteclerc, Martine; May 1, 2005; 23 pp.; In English

Report No.(s): AD-A471177; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471177>

No abstract available

*Image Processing; Phenomenology; Radar Imagery; Radar Targets; Target Recognition*

**20080001528** Army Research Lab., Adelphi, MD USA

**RF Signature Modeling and Analysis - Lessons Learned**

Coburn, W; Le, C; Kenyon, C; Burke, E; May 2005; 29 pp.; In English

Report No.(s): AD-A471299; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Computer Aided Design; Radar Signatures; Radio Frequencies; Signature Analysis*

**20080001547** Virtual Reality Medical Center, San Diego, CA USA

**Virtual Reality as a Tool in Early Interventions**

Wiederhold, Brenda K; Wiederhold, Mark D; Apr 2006; 9 pp.; In English

Report No.(s): AD-A472741; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472741>

No abstract available

*Virtual Reality; Psychotherapy; Artificial Intelligence*

**20080001664** Applied Microsystems Ltd., Sidney, British Columbia Canada

**Micro Hopping Robots for Rescue Operation: Many Tiny Robots with a Single Sensor and Launcher System**

Kato, Yoshiyuki; Aoyama, Hisayuki; Mar 25, 2007; 17 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0331

Report No.(s): AD-A473136; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473136>

This reports research on producing cheap (<\$10) micro robots for locating victims within collapsed buildings. The approach is to use many small robots that search downward (using gravity, rather than a power source) as the best means of locating victims.

DTIC

*Disasters; Launchers; Locomotion; Rescue Operations; Robots*

**20080001699** Army Tank-Automotive Research and Development Command, Warren, MI USA

**The 15th Annual Intelligent Ground Vehicle Competition: Intelligent Ground Robots Created by Intelligent Students**

Theisen, Bernard L; Sep 9, 2007; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473227; TARDEC-17417; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473227>

The Intelligent Ground Vehicle Competition (IGVC) is one of three, unmanned systems, student competitions that were founded by the Association for Unmanned Vehicle Systems International (AUVSI) in the 1990s. The IGVC is a multidisciplinary exercise in product realization that challenges college engineering student teams to integrate advanced control theory, machine vision, vehicular electronics, and mobile platform fundamentals to design and build an unmanned system. Teams from around the world focus on developing a suite of dual-use technologies to equip ground vehicles of the future with intelligent driving capabilities. Over the past 15 years, the competition has challenged undergraduate, graduate and Ph.D. students with real world applications in intelligent transportation systems, the military and manufacturing automation. To date, teams from over 50 universities and colleges have participated. This paper describes some of the applications of the technologies required by this competition and discusses the educational benefits. The primary goal of the IGVC is to advance engineering education in intelligent vehicles and related technologies. The employment and professional networking opportunities created for students and industrial sponsors through a series of technical events over the four-day competition are highlighted. Finally, an assessment of the competition based on participation is presented.

DTIC

*Autonomy; Robots; Students*

**20080001853** Forschungsinstitut fuer Hochfrequenzphysik, Wachtberg-Werthhoven, Germany

**Teleoperation of Unmanned Vehicles: The Human Factor**

Trouvain, Boris; Jun 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473279; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Man Machine Systems; Robots; Teleoperators*



**20080001857** QinetiQ Ltd., Farnborough, UK

**The Lessons Learned in the Application of Augmented Reality**

Franklin, Matthew; Jun 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473286; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Computerized Simulation; Controllers; Training Devices*

**20080001868** Birmingham Univ., UK

**Serious Gaming Technologies Support Human Factors Investigations of Advanced Interfaces for Semi-Autonomous Vehicles**

Stone, Robert; Guest, Robert; Ch'ng, Eugene; McCririe, Christopher; Collis, Christopher; Mannur, Rama; Rehmi, Imran; Jun 2006; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473311; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Autonomy; Game Theory; Human Factors Engineering*

**20080001877** Army Research Inst., Orlando, FL USA

**Current Issues in the Use of Virtual Simulations for Dismounted Soldier Training**

Knerr, Bruce W; Jun 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473321; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Computerized Simulation; Education; Military Personnel; Simulation; Virtual Reality*

**20080001878** North Carolina Univ., Chapel Hill, NC USA

**Virtual Environment Training for Dismounted Teams - Technical Challenges**

Brooks, Fred; Fuchs, Henry; McMillan, Leonard; Whitton, Mary; Cannon-Bowers, Jan; Jun 2006; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Computerized Simulation; Education; Military Personnel; Virtual Reality*

**20080001880** Army Missile Command, Orlando, FL USA

**Augmented Reality: Enabling Component for Effective Live Virtual Constructive Integration**

Dean, Frank; Jaszlics, Sheila; Stilson, Richard; Sanders, Scot; Jun 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473324; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Virtual Reality*

**20080002134** Army Research Inst. for the Behavioral and Social Sciences, Fort Knox, KY USA

**Components of Effective Training**

Lussier, James W; Shadrack, Scott B; Jun 2006; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473297; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Education; Leadership*

**20080002147** National Univ. of Singapore, Singapore

**Timed Formalisms for Plan Ontology and Processes**

Dong, Jin S; Sun, Jun; Zhang, Xian; Jun 11, 2007; 21 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0032

Report No.(s): AD-A473082; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473082>

In the context of military planning, recent research effort focuses more on specifying the static features and relations in

the plan ontology. However, military plans, e.g. air campaign planning, have additional operations and timing requirements. In this project, the PI proposed an appropriate real-timed formalism, Timed CSP with some possible extensions, to model the plans. In this approach, Timed CSP is used to model the processes of the plans. The additional critical system requirements are then captured by the extensions. An associated prototype tool, HORAE, is developed for modeling, and reasoning the military plans

DTIC

*Formalism; Military Operations; Planning*

**20080002154** Toronto Univ., Ontario, Canada

**Some Human Factors Considerations for Designing Mixed Reality Interfaces**

Milgram, Paul; Jun 1, 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473283; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Continuums; Display Devices; Human Factors Engineering; Man Machine Systems*

**20080002206** Institute for Human Factors TNO, Soesterberg, Netherlands

**Tele-Presence: Bringing the Operator Back in the Loop**

Erp, van, Jan B; Duistermaat, Maaik; Jansen, Chris; Groen, Eric; Hoedemaeker, Mariëka; Jun 2006; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473299; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Remotely Piloted Vehicles; Man Machine Systems; Situational Awareness; Psychomotor Performance*

**20080002372** Florida State Univ., Tallahassee, FL USA

**Engine Test Cell Aeroacoustics and Recommendations**

Tam, Christopher; Oct 2007; 115 pp.; In English

Report No.(s): AD-A473537; AEDC-TR-06-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473537>

Ground testing of turbojet engines in test cells necessarily involves very high acoustic amplitudes, often enough and severe enough that testing is interrupted and facility hardware and test articles are damaged. The acoustic response of test cells containing energetic jets is poorly understood and generally unpredictable. Nevertheless, there is a clear need to be able to predict deleterious acoustic events in advance of facility entry. A predictive capability would permit evaluating possible fixes in advance of the entry to preclude interruption of testing and damage to hardware, both of which are costly and disruptive of weapons systems program schedules. To establish the needed predictive capability, the Arnold Engineering Development Center (AEDC) is implementing a computational aeroacoustics (CAA) capability. This report by C. K. Tam is one of several steps toward that goal. Here, Tam consolidates what is presently known about the aeroacoustics of jets and flowing ducts. The material presented includes analytical and semi-empirical models of various acoustic situations as well as test data. Also included is a proposal to ameliorate a particularly damaging acoustic event referred to as super resonance. A future report will present CAA technology appropriate for numerical solution of the flow equations as applied to jet cells.

DTIC

*Acoustics; Aeroacoustics; Coding; Computer Systems Performance; Engine Tests; Turbojet Engines*

**20080002427** Naval Postgraduate School, Monterey, CA USA

**Modeling and Implementation of PID Control for Autonomous Robots**

Williamson, Todd A; Jun 2007; 73 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473631; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473631>

PID control is optimized here in order to control the course of a small autonomous robot for military applications. A Visual Basic program was written to model the robot response to the controller and provide a method of optimization. The computer model is based on empirical data gathered through testing. Controller theory, robot mechanics, and hardware implementation are all discussed as they relate to the ability of the robot to get from one location to another along an efficient path. The controller was tuned to provide optimal direction control and the model was evaluated for accuracy. The robot completed a

170-degree pivot turn in 4.0 seconds and a 170-degree differential turn in 5.1 seconds. The time predicted by the model for each turn was within 10% of what the robot did.

DTIC

*Autonomous Navigation; Autonomy; Control Theory; Derivation; Models; Robots*

**20080002429** Naval Research Lab., Washington, DC USA

**Multi-Camera, High-Speed Imaging System for Kinematics Data Collection**

Geder, Jason; Sandberg, William C; Ramamurti, Ravi; Sep 21, 2007; 14 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473635; NRL/MR/6401--07-9054; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473635>

A two-camera system was devised and created to determine the kinematics of flapping fin and flapping wing vehicles. Each camera is set up to capture triggered, high-speed (up to 10,000 frames per second) images of the appendage in a test environment. Using direct linear transforms, each camera is calibrated to convert image coordinates to an alternate coordinate system. Points of interest on the appendage are selected from each camera image at matching times throughout multiple flapping cycles and converted from sets of two two-dimensional coordinates to single three-dimensional coordinates. These three-dimensional coordinates are then compared with desired kinematics and necessary changes are made to improve the performance of the appendage. Kinematics comparisons are supplemented with force comparisons as experimental force measurements are compared with force calculations made using computational fluid dynamics simulations.

DTIC

*Biomimetics; Cameras; Computational Fluid Dynamics; Data Acquisition; High Speed; Imaging Techniques; Kinematics; Servomechanisms*

**20080002549** Naval Postgraduate School, Monterey, CA USA

**Learning Adversary Modeling from Games**

Avellino, Paul; Sep 2007; 97 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473691; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Since ancient times, adversary modeling has been used during wargaming exercises in which military leaders have recreated past battles or simulated future battles in order to educate military professionals. Although the technology today is much different, adversary modeling still serves the same goals to help military professionals learn tactics from past successes and mistakes. In the computer age, highly accurate models and simulations of the enemy can be created. However, including the effects of motivations, capabilities, and weaknesses of adversaries in current wars is still extremely difficult. Limit Texas Hold em poker, with many attributes similar to real-world warfare, is an excellent test-bed to study and improve adversary modeling. For example, stochastic outcomes which deal with multiple independent agents, deception, and acting amidst uncertainty, are some of the aspects of poker that closely resemble important aspects of warfare. These attributes make poker a better choice as a study platform than other traditional games, such as chess, where there is no deception or uncertainty. The defined rules of poker provide researchers with a controlled environment to improve and test adversary-modeling techniques. Perfecting adversary modeling in poker will allow simulators to improve and generate more accurate models for wargames, giving the advantage in current and future battles.

DTIC

*Artificial Intelligence; Games; Simulation; War Games*

**20080002628** Naval Postgraduate School, Monterey, CA USA

**Using Knowledge Value Added (KVA) for Evaluating Cryptologic it Capabilities: Trial Implementation**

Lambeth, III, Ira D; Clapp, Hubert N; Sep 2007; 85 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473808; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Program managers throughout the DoD are faced with technology portfolio management problems. Critical to these efforts is the need to track the performance of the technology on a routine, ongoing basis. This thesis focuses on solving this general problem in the specific context of the USA Navy's Cryptologic Carry-On Program (CCOP). This study provides a demonstration of how a software suite that monitors process performance can be implemented to provide ongoing return on investment information about CCOP technology. This follow-on research and trial implementation demonstrate how the Knowledge Value Added (KVA) Methodology that is embedded in the performance monitoring software is used to formulate a framework for extracting and analyzing performance parameters and measures of effectiveness for each CCOP system. KVA

was used to measure the effectiveness and efficiency of CCOP systems and the impact they have on the Intelligence Collection Process (ICP) onboard the USS GONZALES.

DTIC

*Computer Programs; Cryptography*

**20080012301** California Inst. of Tech., Pasadena, CA USA

**Method and apparatus for adaptive force and position control of manipulators**

Seraji, Homayoun, Inventor; August 22, 1989; 35 pp.; In English

Patent Info.: Filed April 6, 1987; US-PATENT-4,860,215; US-PATENT-APPL-SN-035061; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012301>

The present invention discloses systematic methods and apparatus for the design of real time controllers. Real-time control employs adaptive force/position by use of feedforward and feedback controllers, with the feedforward controller being the inverse of the linearized model of robot dynamics and containing only proportional-double-derivative terms is disclosed. The feedback controller, of the proportional-integral-derivative type, ensures that manipulator joints follow reference trajectories and the feedback controller achieves robust tracking of step-plus-exponential trajectories, all in real time. The adaptive controller includes adaptive force and position control within a hybrid control architecture. The adaptive controller, for force control, achieves tracking of desired force setpoints, and the adaptive position controller accomplishes tracking of desired position trajectories. Circuits in the adaptive feedback and feedforward controllers are varied by adaptation laws.

Official Gazette of the U.S. Patent and Trademark Office

*Adaptive Control; Control Systems Design; Manipulators*

## 64

### NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

**20080000365** Brown Univ., Providence, RI USA

**The Discontinuous Galerkin Method for the Multiscale Modeling of Dynamics of Crystalline Solids**

Wang, Wei; Li, Xiantao; Shu, Chi-Wang; Aug 26, 2007; 42 pp.; In English

Contract(s)/Grant(s): W911NF-04-1-0291; DMS-0510345

Report No.(s): AD-A472151; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472151>

We present a multiscale model for numerical simulation of dynamics of crystalline solids. The method couples nonlinear elastodynamics as the continuum description and molecular dynamics as another component at the atomic scale. The governing equations on the macroscale are solved by the discontinuous Galerkin method, which is built up with an appropriate local curl-free space to produce coherent displacement field. The constitutive data are based on the underlying atomistic model: it is either calibrated prior to the computation or obtained from molecular dynamics as the computation proceeds. The decision to use either the former or the latter is made locally for each cell based on suitable criteria.

DTIC

*Crystallinity; Galerkin Method; Solids*

**20080000369** Michigan Univ., Ann Arbor, MI USA

**A Grid-Free Approach for Plasma Simulations (Grid-Free Plasma Simulation Techniques)**

Krasny, Robert; Christlieb, Andrew J; Verboncoeur, John P; Emhoff, Jerold W; Boyd, Iain D; Jul 10, 2007; 26 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0199; FO12457

Report No.(s): AD-A472161; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472161>

This project draws together a team of researchers to develop new grid-free tools for plasma simulations. The objectives are: (1) to develop a grid-free field solver, fluid model, and kinetic model, (2) to evaluate these tools in comparison with traditional mesh-based methods, and (3) to demonstrate the capability of the grid-free approach in an application of USAF interest. The field solver will use boundary integral methods and a recently developed tree code algorithm to compute the electrostatic force induced by a set of charged particles. The kinetic model will use tree-based statistical procedures for inter-particle collisions. Various hybrid grid-free simulations will be possible using these tools. The resulting grid-free

approach will have several advantages over traditional mesh-based methods: it will eliminate the need for elaborate volume-meshing routines required to handle complex geometry, and will avoid the spurious numerical artifacts in the particle distribution that can arise in mesh-based schemes.

DTIC

*Algorithms; Boundaries; Charged Particles; Electrostatics; Monte Carlo Method; Plasmas (Physics); Simulation*

**20080000375** Puerto Rico Univ., Mayaguez, Puerto Rico

**Turbulence Time Series Data Hole Filling using Karhunen-Loeve and ARIMA methods**

Chang, J L; Nazari, H; Font, C O; Gilbreath, G C; Oh, E; Jan 2007; 9 pp.; In English

Report No.(s): AD-A472169; NRL-RN-07-1226-1708; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472169>

Measurements of optical turbulence time series data using unattended instruments over long time intervals inevitably lead to data drop-outs or degraded signals. We present a comparison of methods using both Principal Component Analysis, which is also known as the Karhunen-Loeve decomposition, and ARIMA that seek to correct for these event-induced and mechanically-induced signal drop-outs and degradations. We report on the quality of the correction by examining the Intrinsic Mode Functions generated by Empirical Mode Decomposition. The data studied are optical turbulence parameter time series from a commercial long path length optical anemometer/scintillometer, measured over several hundred metres in outdoor environments.

DTIC

*Karhunen-Loeve Expansion; Proving; Stochastic Processes; Time Series Analysis; Turbulence*

**20080000376** Florida Univ., Gainesville, FL USA

**Investigation into the Combined Effects of Compaction, Strain Rate Sensitivity, and Anisotropic Damage of a Geologic Target on the Trajectory Stability of Rigid Penetrators**

Cazacu, Oana; Ionescu, Ioan R; May 1, 2007; 58 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0156

Report No.(s): AD-A472172; AFOSR/PKR3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472172>

This report presents the results of an experimental investigation into the combined effects of inelasticity and strain rate sensitivity on penetration into geologic or geological derived targets. Both material models and specific computational methods have been developed. A new class of compressible rigid viscoplastic models were proposed to capture the solid-fluid transition in behavior at high strain rates, account for damage/plasticity couplings and viscous effects which are observed in geological and cementitious materials. A hybrid time-discretization was used to model the non-stationary flow of the target material and the projectile-target interaction, i.e. an explicit Euler method for the projectile equation and a forward (implicit) method for the target boundary value problem. At each time step, a mixed finite-element and finite-volume strategy was used to solve the 'target' boundary value problem. Specifically, the nonlinear variational inequality for the velocity field was discretized using the finite element method while a finite volume method was used for the hyperbolic mass conservation and damage evolution equations. To solve the velocity problem, a decomposition-coordination formulation coupled with the augmented lagrangian method was adopted. Numerical simulations of penetration into concrete were performed. By conducting a time step sensitivity study it was shown that the numerical model is robust and computationally inexpensive. For the constants involved in the model (shear and volumetric viscosities, cut-off yield limit and exponential weakening parameter for friction) that cannot be determined from data, a parametric study was performed.

DTIC

*Anisotropy; Compacting; Damage; Penetration; Sensitivity; Stability; Strain Rate; Targets; Trajectories*

**20080000393** Massachusetts Univ., Amherst, MA USA

**Spectral Clustering with Links and Attributes**

Neville, Jennifer; Adler, Micah; Jensen, David; Jan 2004; 13 pp.; In English

Contract(s)/Grant(s): F30602-00-2-0597; F30602-01-2-0566

Report No.(s): AD-A472209; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472209>

If relational data contain communities-groups of inter-related items with similar attribute values-a clustering technique that considers attribute information and the structure of relations simultaneously should produce more meaningful clusters than

those produced by considering attributes alone. We investigate this hypothesis in the context of a spectral graph partitioning technique, considering a number of hybrid similarity metrics that combine both sources of information. Through simulation, we find that two of the hybrid metrics achieve superior performance over a wide range of data characteristics. We analyze the spectral decomposition algorithm from a statistical perspective and show that the successful hybrid metrics exaggerate the separation between cluster similarity values, at the expense of increased variance. We cluster several relational datasets using the best hybrid metric and show that the resulting clusters exhibit significant community structure, and that they significantly improve performance in a related classification task.

DTIC

*Spectra*

**20080000397** Naval Research Lab., Washington, DC USA

**Applying the Hilbert-Huang Decomposition to Horizontal Light Propagation C2n data**

Chang, Mark P; Roura, Erick A; Font, Carlos O; Gilbreath, Charmaine; Oh, Eun; Jan 2006; 9 pp.; In English

Report No.(s): AD-A472216; NRL-RN-07-1226-0268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472216>

The Hilbert Huang Transform is a new technique for the analysis of non-stationary signals. It comprises two distinct parts: Empirical Mode Decomposition (EMD) and the Hilbert Transform of each of the modes found from the first step to produce a Hilbert Spectrum. The EMD is an adaptive decomposition of the data, which results in the extraction of Intrinsic Mode Functions (IMFs). We discuss the application of the EMD to the calibration of two optical scintillometers that have been used to measure C2n over horizontal paths on a building rooftop, and discuss the advantage of using the Marginal Hilbert Spectrum over the traditional Fourier Power Spectrum.

DTIC

*Decomposition; Hilbert Space; Hilbert Transformation; Integral Transformations; Light (Visible Radiation); Wave Propagation*

**20080000398** Naval Research Lab., Washington, DC USA

**Patching C2n Time Series Data Holes using Principal Component Analysis**

Chang, Mark P; Nazari, Haedeh; Font, Carlos O; Gilbreath, G C; Oh, Eun; Jan 2007; 9 pp.; In English

Report No.(s): AD-A472217; NRL-RN-07-1226-1134; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472217>

Measurements of C2n time series using unattended commercial scintillometers over long time intervals inevitably lead to data drop-outs or degraded signals. We present a method using Principal Component Analysis ‘also known as Karhunen-Loeve decomposition’ that seeks to correct for these event-induced and mechanically-induced signal degradations. We report on the quality of the correction by examining the Intrinsic Mode Functions generated by Empirical Mode Decomposition.

DTIC

*Factor Analysis; Principal Components Analysis; Time Series Analysis*

**20080000422** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Unreliable Retrial Queues in a Random Environment**

Cordeiro, Jr., James D; Sep 2007; 175 pp.; In English

Contract(s)/Grant(s): FIATA0-60-3-4J001

Report No.(s): AD-A472262; AFIT/DS/ENS/07-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472262>

This dissertation investigates stability conditions and approximate steady-state performance measures for unreliable, single-server retrial queues operating in a randomly evolving environment. In such systems, arriving customers that find the server busy or failed join a retrial queue from which they attempt to regain access to the server at random intervals. Such models are useful for the performance evaluation of communications and computer networks which are characterized by time-varying arrival, service and failure rates. To model this time-varying behavior, we study systems whose parameters are modulated by a finite Markov process. Two distinct cases are analyzed. The first considers systems with Markov-modulated arrival, service, retrial, failure and repair rates assuming all interevent and service times are exponentially distributed. The joint process of the orbit size, environment state, and server status is shown to be a tri-layered, level-dependent quasi-birth-and-death (LDQBD) process, and we provide a necessary and sufficient condition for the positive recurrence of LDQBDs using

classical techniques. Moreover, we apply efficient numerical algorithms, designed to exploit the matrix-geometric structure of the model, to compute the approximate steady-state orbit size distribution and mean congestion and delay measures. The second case assumes that customers bring generally distributed service requirements while all other processes are identical to the first case. We show that the joint process of orbit size, environment state and server status is a level-dependent, M/G/1-type stochastic process. By employing regenerative theory, and exploiting the M/G/1-type structure, we derive a necessary and sufficient condition for stability of the system. Finally, for the exponential model, we illustrate how the main results may be used to simultaneously select mean time customers spend in orbit, subject to bound and stability constraints.

DTIC

*Algorithms; Queueing Theory; Stability; Steady State*

**2008000434** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Polarimeter Blind Deconvolution Using Image Diversity**

Strong, David M; Sep 2007; 135 pp.; In English

Report No.(s): AD-A472288; AFIT/DS/ENG/07-20; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472288>

This research presents an algorithm that improves the ability to view objects using an electro-optical imaging system with at least one polarization sensitive channel in addition to the primary channel. An innovative algorithm for detection and estimation of the defocus aberration present in an image is also developed. Using a known defocus aberration, an iterative polarimeter deconvolution algorithm is developed using a generalized expectation-maximization (GEM) model. The polarimeter deconvolution algorithm is extended to an iterative polarimeter multiframe blind deconvolution (PMFBD) algorithm with an unknown aberration. Using both simulated and laboratory images, the results of the new PMFBD algorithm clearly outperforms an RL-based MFBD algorithm. The convergence rate is significantly faster with better fidelity of reproduction of the targets. Clearly, leveraging polarization data in electro-optical imaging systems has the potential to significantly improve the ability to resolve objects and, thus, improve Space Situation Awareness.

DTIC

*Algorithms; Electro-Optics; Polarimeters*

**2008000978** North Carolina Agricultural and Technical State Univ., Greensboro, NC USA

**Computational Methods for Probabilistic Target Tracking Problems**

Warrack, Anthony G; Kurepa, Alexandra; Sep 2007; 47 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-1-0465

Report No.(s): AD-A472589; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472589>

The grant started in 2003. Initially a cohort of two graduate students and four sophomore undergraduate students was recruited. The students received special training in probabilistic and statistical methods pertaining to target -tracking problems. Particular topics included Kalman filtering, the EM Algorithm, smoothing methods, and density estimation. In the summer of 2004 the graduate students accompanied Dr. Warrack to The Naval Undersea Warfare Center, Newport, RI (NUWC-Newport), for a 10 week internship working under the supervision of Dr Roy Streit. This resulted in a presentation at NUWC, Applying Density Estimation and Nonparametric Smoothing Techniques to Tracking Problems. In the summer of 2005 the undergraduates accompanied Dr. Warrack to NUWC-Newport for a 10 week internship under the direction of Dr. Marcus Graham. A presentation Using Parametric and Nonparametric Smoothing Techniques to Improve Estimation with the EM Algorithm was given at NUWC. All six of the students have graduated with high grade point averages. Three received NAVSEA job offers, one of whom is working at NSWCDD-Dahlgren, VA. During an extension year two graduate students and two undergraduates were supported.

DTIC

*Algorithms; Regression Analysis; Tracking (Position); Tracking Problem*

**20080001206** Signal Innovations Group, Inc., Durham, NC USA

**Multi-Sensor Information Integration and Automatic Understanding**

Welborn, Matthew; Venters, Samantha; Aug 2007; 6 pp.; In English

Contract(s)/Grant(s): N00014-05-C-0294

Report No.(s): AD-A472949; SIG-ONR-OPT1-Q3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the last reporting period, important progress has been made in the system for both the object tracking and

anomalous behavior algorithms. We have completed significant enhancements to the background color modeling that improves both the efficiency and performance of the overall system, allowing more consistent and robust object tracking and anomalous behavior detection. In addition, we have completed several data collection programs, including efforts that will support analysis for multi-camera analysis as well as combined video and acoustic tracking capabilities. SIG has also completed an initial implementation of our real-time analytics framework that can support the testing process. Further motivation for developing real-time video analytics is the desire to transition this technology into fielded systems.

DTIC

*Algorithms; Change Detection; Multisensor Applications*

**20080001271** Massachusetts Inst. of Tech., Cambridge, MA USA

**Continued Investigation of Small-Scale Air-Sea Coupled Dynamics using CBLAST Data**

Yue, Dick K; Sep 30, 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-01-1-0159

Report No.(s): AD-A473066; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study uses direct numerical simulation, large-eddy simulation, and large-wave simulation for both air and ocean turbulent flows with surface waves to investigate the dynamics of coupled air-sea boundary layers at relatively small spatial scales. With extensive simulation in collaboration with measurement, we identify and assess the key transport processes within the atmosphere-ocean wave boundary layer (WBL). This project obtains a physical foundation for the parameterization of the momentum, mass and heat transfer within the atmosphere-ocean WBL.

DTIC

*Atmospheric; Numerical Analysis; Ocean Models*

**20080001273** Towson Univ., Towson, MD USA

**Algorithms and Implementation for P-adic Cyclic Codes Using Exact Arithmetic Library Developed for Quantum Computing**

Lu, Chao; Jan 16, 2007; 19 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0038

Report No.(s): AD-A473068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first part of the research is that we have expanded the Exact Scientific Computational Library (ESCL), and Dixon's algorithm on rational  $N$  by  $N$  matrix inverse was implemented. We studied and experimented the relation of required length  $M$  of  $p$ -adic expansion and the prime  $p$ , and the possible use of the length of periodicity of a rational number's  $p$ -adic expansion in determining the length of required  $M$  in rational matrix operations. The second part of the work is to develop and implement computational algorithms for  $p$ -adic cyclic code generation, which is based on the results of the paper, 'Modular and  $p$ -adic cyclic codes', by A.R. Calderbank and N.J.A. Sloane. Algorithms and software have been developed to give an alternative solution to factorize the polynomial  $X^n-1$  over the ring of integers modulo  $p(a)$ , where  $p$  is a prime not dividing  $n$ , and it can generate the table of cyclic codes using the divisors of  $X^n-1$  as their generator polynomials. All the implementation of ESCL is in C++, as well as the software to generate  $p$ -adic cyclic codes.

DTIC

*Algorithms; Arithmetic; Libraries; Quantum Computation*

**20080001398** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Modeling of Moguls on an Endurance Test Course**

Brudnak, Mark J; Gunter, David D; Bylsma, Wesley; Jun 2007; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472154>

This paper presents an approach to modeling discrete features on a U.S. Army endurance test course. The features in this case are 39 moguls with heights varying between 0.36 and 0.63 m built into a portion of the course. Because they are enumerable and localized, they do not lend themselves to traditional modeling techniques such as RMS, PSD, IRI, etc. We assume that the mogul has a well defined shape and we evaluate five different approaches to modeling this shape assuming that each mogul may be thought of as an ideal shape superimposed with stationary noise. The models that we evaluate are the Gaussian function, the Hanning window, the support vector machine, a two-Gaussian function and a two-Gaussian function with fixed width and amplitude ratios. We evaluate these models by computing the RMS error of each best fit and by evaluating the stationarity of the residue. We further evaluate each mogul model by running a HMMWV dynamics model over



each and comparing several responses to those obtained from the profiled mogul. In our analysis we find that a model consisting of two Gaussian functions with related widths and amplitudes yields an unbiased estimate of a mogul and can be made to approximate any mogul by adjusting its width and amplitude.

DTIC

*Models; Endurance; Human Performance*

**20080001491** Defence Science and Technology Organisation, Edinburgh, Australia

**Approximation of Bit Error Rates in Digital Communications**

Weinberg, Graham V; Lee, Sharon; Jun 2007; 43 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471551; DSTO-TN-0761; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA471551>

This report examines the estimation of bit error rates (BERs) in digital communications. Specifically, the authors will investigate recent work on using bounds to construct approximations for differential quaternary phase shift keying (DQPSK) transmission with Gray coding over an additive white Gaussian noise channel (AWGNC). In previous research, an estimate of this BER was constructed by averaging a lower and upper bound. The authors show that more direct methods can be applied to estimate the BER and that, in some cases, more accurate results can be obtained. The BER is a fundamental performance measure of a system, quantifying the reliability or integrity of a received signal. The instantaneous BER, for many practical communication systems, in particular, wireless communications systems, can be written as a function involving the standard Marcum Q-Function. This famous function has received much attention in the digital signal processing literature due to its intractability. This project involves estimation of the Marcum Q-Function. It should be of interest to both the radar and communications research communities. The authors examine bit error rate estimation in digital communications. They show that a method applied in a recent publication that uses bounds to estimate bit error rates can be improved considerably by using more direct techniques of estimation. The work is relevant to the long-range research efforts into radar detection issues associated with Task AIR 04/206, EWRD Support for AP-3C E/LM2022 Radar System. Although focusing on a communications application, the results transfer directly to the latter. The technique examined here will be useful for engineers and scientists looking for efficient and accurate approximations for intractable integrals.

DTIC

*Approximation; Bit Error Rate; Errors; Estimates; Least Squares Method; Phase Shift; Pulse Communication; Signal Processing*

**20080001607** University of Southern California, Marina del Rey, CA USA

**Constraint-Based Integration of Geospatial and Online Sources**

Knoblock, Craig A; Sep 10, 2007; 12 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0105

Report No.(s): AD-A472916; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this research project, we developed a constraint-based approach to integrating traditional and non-traditional online geographic data sources. There were three areas where we made significant advances. First, we developed a constraint satisfaction framework to integrate data sources for the labeling of buildings in satellite imagery. Second, we developed an automatic approach for the integration of maps, vector data, and high-resolution satellite imagery. Third, we developed an approach to automatically extract the road network and the textual labels from a raster map.

Author

*Pattern Recognition; Extraction; Satellite Imagery*

**20080001669** Massachusetts Inst. of Tech., Lexington, MA USA

**Analog-to-Information Study Phase**

Forsythe, K W; Goodman, J I; Green, M R; Miller, B A; Raz, G M; Jackson, J H; Oct 10, 2007; 111 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0002

Report No.(s): AD-A473144; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473144>

Many communications and Radar receivers must process data over a very wide band, which requires either high-rate analog-to-digital converters (ADCs) or multichannel receivers. The information content of that wideband data, however, is often sparse in some basis. Analog-to-Information (A2I) receivers exploit this sparseness in both the digital and analog

domains by non-adaptively spreading the signal energy (analog) and using digital signal processing to recover the signal from an ADC sampling at a sub-Nyquist rate. A subsampled ADC implies the use of fewer receiver channels or less expensive, lower-rate devices. This report documents the signal processing techniques for such receivers developed by the MIT Lincoln Laboratory/GMR Research and Technology team in the study phase of the A2I program. We have developed two new A2I signal processing methods, both significantly outperforming compressed sensing (CS) techniques currently in the literature, which typically fail when signals occupy more than 15-20% of the downsampled band. One of our methods, Nonlinear Affine processing (NoLaff), uses a nonlinear front-end to spread signal energy before the sub-Nyquist ADC, and uses hypothesis testing to reconstruct the signal. In simulations, this technique has shown that it can reconstruct wideband signals occupying up to 72% of the downsampled basis. It is also much less sensitive to the difficulties CS has detecting signals with large magnitude variation in the compressible basis. Our other method, called Variable Projection and Unfolding (VPU), spreads the signal energy using random linear projections similar to those used in compressed sensing, but is able to reconstruct signals occupying nearly 100% of the downsampled basis. VPU achieves this using a technique similar to matching pursuit; the key difference being that VPU searches over blocks of consecutive columns rather than one column at a time.

DTIC

*Analog Data; Analog to Digital Converters; Detection; Receivers; Signal Processing*

**20080001685** Army Research Lab., Adelphi, MD USA

**Adaptive Deblurring of Noisy Images**

Young, S S; Driggers, Ronald G; Teaney, Brian P; Jacobs, Eddie L; Oct 2007; 30 pp.; In English

Report No.(s): AD-A473175; ARL-TR-4276; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473175>

This report proposes a practical sensor deblur filtering method for images that are contaminated with noise. A sensor blurring function is usually modeled via a Gaussian-like function having a bell shape. The straightforward inverse function results in magnification of noise at the high frequencies. In order to address this issue, we apply a special spectral window to the inverse blurring function. This special window is called the power window, which is a Fourier-based smoothing window that preserves most of the spatial frequency components in the passband and attenuates quickly at the transition-band. The power window is differentiable at the transition point which gives a desired smooth property and limits the ripple effect. Utilizing properties of the power window, we design the deblurring filter adaptively by estimating energy of the signal and noise of the image to determine the passband and transition-band of the filter. The deblurring filter design criteria are: a) filter magnitude is less than one at the frequencies where the noise is stronger than the desired signal (transition-band); and b) filter magnitude is greater than one at the other frequencies (passband). Therefore, the adaptively designed deblurring filter is able to deblur the image by a desired amount based on the estimated or known blurring function while suppressing the noise in the output image. The deblurring filter performance is demonstrated by a human perception experiment which 10 observers are to identify 12 military targets with 12 aspect angles. The results of comparing target identification probabilities with blurred, deblurred, adding 2 level of noise to blurred, and deblurred noisy images are reported.

DTIC

*Adaptation; Detectors; Focusing*

**20080001848** Naval Postgraduate School, Monterey, CA USA

**Distributed Algorithms for Beamforming in Wireless Sensor Networks**

Papalexidis, Nikolaos; Jun 2007; 136 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473271; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Sensor nodes in a wireless sensor network (WSN) can establish a link with a UAV by using beam forming techniques to from a random array with position errors. The position errors' effect in the array performance is examined using a MATLAB-based simulation model. In order to spread the processing and communication load among the nodes, two new distributed algorithms for beam forming in WSN, based on the least squares (LS) approximation of the desired array response, are proposed. The first is a distributed implementation of the QR decomposition, and the second is an iterative method for solving the LS problem. Results indicate that the processing load is effectively shared among the nodes. Especially, in the second approach, the processing load can be lower than that of the centralized approach, depending on the algorithm's convergence. For both algorithms, the tradeoff for the ability to spread the processing load is the increased communication cost, which could cause an overall increase in the total power consumption in the network. However, the average power per participating sensor node is still lower than that required by the cluster head in the centralized approach. Consequently, the

network's susceptibility to failures due to excessive power consumption is greatly reduced.

DTIC

*Algorithms; Beamforming; Communication Networks*

**20080001884** Naval Academy, Annapolis, MD USA

**6D Anti-de Sitter Space Solutions to Einstein's Field Equation with a Scalar Field**

Kehrer, Jordon P; May 4, 2007; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473330; USNA-TSPR-353; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this Trident Scholar project was to study a scalar field in six dimensional Anti-de Sitter space by extending the Randall-Sundrum model. This model included a single scalar field and two compactible extra dimensions. One of these extra dimensions was defined by periodic boundary conditions. The other extra dimension was compactible and stabilized by a scalar field in the space. The shape of the six-dimensional space was defined by its metric, a mathematical structure that described how the length scale changes as a function of position in space and time. The metric was required to satisfy a differential equation known as the Einstein Field equation. By starting with some known facts about the structure of the metric, the Einstein equation was decomposed into a system of differential equations that were solved to find the final solution for the metric. In addition to the requirement of the Einstein Field equation, once the scalar field was added to the system, it needed to satisfy its own differential equation, the Klein-Gordon equation. Perturbation methods were used to simultaneously solve the Einstein Field equation and the Klein-Gordon equation to find the back reaction of the energy due to the scalar field on the six-dimensional Anti-de Sitter space metric. This process gave a new metric for the space that included the effect of the scalar field. The physical characteristics of the newly calculated space were explored to ensure that it satisfied the hierarchy problem as well as to determine how the laws of physics were affected by the warping of the space.

DTIC

*Mathematical Models; Partial Differential Equations; Scalars*

**20080001885** Naval Academy, Annapolis, MD USA

**A Quantitative Analysis of Starting Jet Vortex Ring Entrainment at Low Reynolds Number**

Dulude, Alex G; May 7, 2007; 110 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473331; USNA-TSPR-351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The future propulsion of very small unmanned air and underwater vehicles operating at Reynolds numbers in the hundreds or less may be accomplished by pulsing a jet of fluid rather than more conventional methods of propulsion such as propellers and turbo jets as used by large-scale vehicles. Pulse jet propulsion produces trailing vortex rings and recent research concerning the formation and evolution of vortex rings has suggested that these structures may be exploited to augment the thrust and increase the efficiency of pulsed jet propulsion. Limited studies have indicated correlations between the length and shape of the generating pulse and the formation, fluid entrainment, and thrust augmentation provided by the resultant vortex ring at ring Reynolds number as low as approximately 13,000. The onset of vortex ring pinch-off has previously been shown to be a limit to this thrust augmentation. The design, construction, and implementation of a novel, piston-cylinder-type, vortex ring generator to confirm and further improve measurements of fluid entrainment and other formation characteristics has been accomplished. This apparatus was used in dye injection studies and stereoscopic particle image velocimetry (SPIV) studies to qualitatively examine the evolution of the vortex ring, and evaluate the effects of pulse length and shape on the formation of the vortex ring over a range of Reynolds numbers between 250 and 13,000. Results from this investigation at a Reynolds number of 13,000 are in close agreement with those of previous research, indicating that pulse shaping can delay the phenomena of vortex ring pinch-off by as much as 20% of the stroke length to diameter ratio. Results from lower Reynolds numbers show a trending toward even greater delay of pinch-off, as Reynolds number decreases. Tests conducted at  $Re=250$  indicate a delay in pinch-off in excess of 400% over that seen at  $Re=13,000$ .

DTIC

*Entrainment; Jet Propulsion; Low Reynolds Number; Quantitative Analysis; Reynolds Number; Vortex Generators; Vortex Rings*

**20080001903** California Inst. of Tech., Pasadena, CA USA

**Packet-Based Control Algorithms for Cooperative Surveillance and Reconnaissance**

Murray, Richard M; Oct 2007; 11 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0169; Proj-2304

Report No.(s): AD-A473350; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project focused on developing algorithms for multi-vehicle, cooperative surveillance and reconnaissance that operate

in a modern net-centric environment. These algorithms take into account the packet-based nature of modern networks by coding information in a manner that makes the performance of the system robust to packet loss, variable latency, and repeated transmissions. Results include analysis and design of estimation and control algorithms in the presence of packet loss and across multi-hop data networks, distributed estimation and sensor fusion algorithms for networked environments, development of sensor selection and coverage techniques for spatio-temporal planning, and analysis of robustness to process uncertainty and computational node failure. Applications include cooperative estimation, formation management, and semi-autonomous ISR.

DTIC

*Algorithms; Control Theory; Networks; Reconnaissance; Surveillance*

**20080001933** Naval Postgraduate School, Monterey, CA USA

**Optical Flow Analysis and Kalman Filter Tracking in Video Surveillance Algorithms**

Semko, David A; Jun 2007; 89 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473398; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A SIMULINK-based algorithm for monitoring contacts in a surveillance video sequence using Optical Flow Analysis and Kalman Filters was developed. The Horn-Schunck Optical Flow Algorithm was used to identify contacts in a surveillance video sequence. The position and behavior of these contacts was monitored by a modification of the traditional Kalman Filter. The Kalman Filter algorithm implemented has the ability to track up to ten contacts at a time correctly assigning each of a maximum ten filters to their respective contacts on a frame-by-frame basis. Initial tests using artificial data show good performance of both the Optical Flow Analysis algorithm and the Kalman Filter Tracking algorithm. Surveillance video data was also used to test the algorithm with promising results.

DTIC

*Algorithms; Kalman Filters; Optical Filters; Surveillance*

**20080001957** Air Force Research Lab., Edwards AFB, CA USA

**Numerical and Experimental Investigation of Microchannel Flows with Rough Surfaces (Preprint)**

Lilly, T C; Duncan, J A; Nothnagel, S L; Gimelshein, S F; Gimelshein, N E; Ketsdever, A D; Wysong, I J; Mar 28, 2007; 33 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473468; AFRL-PR-ED-JA-2007-378; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A conical surface roughness model applicable to particle simulations has been developed. The model has been experimentally validated for channel flows using helium and nitrogen gases at Reynolds numbers from 0.01 to 10 based on inlet conditions. To efficiently simulate gas-surface interaction, molecular collisions with the actual rough surface are simulated by collisions with a randomly positioned conical hole having a fixed opening angle. This model requires only one surface parameter, average surface roughness angle. This model has also been linked to the Cercignani-Lampis scattering kernel as a required reference for use in deterministic kinetic solvers. Experiments were conducted on transitional flows through a 150-micron tall, 1cm wide, 1.5cm long microchannel where the mean free path is on the order of the roughness size. The channel walls were made of silicon with: (i) polished smooth surfaces, (ii) regular triangular roughness, and (iii) regular square roughness with characteristic roughness scales. For the triangular roughness, mass flow reductions ranged from 6% at the higher stagnation pressures tested to 25% at the lower stagnation pressures tested when compared to the smooth channel.

DTIC

*Channel Flow; Microchannel Plates; Microchannels; Numerical Analysis*

**20080002097** NASA Langley Research Center, Hampton, VA, USA

**A Change Point Method for Linear Profile Data**

Mahmoud, Mahmoud A.; Parker, Peter A.; Woodall, William H.; Hawkins, Douglas M.; [2007]; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NSF DMI-03-54859; 23=090-21-TE; Copyright; Avail.: Other Sources

We propose a change point approach based on the segmented regression technique for testing the constancy of the regression parameters in a linear profile data set. Each sample collected over time in the historical data set consists of several bivariate observations for which a simple linear regression model is appropriate. The change point approach is based on the likelihood ratio test for a change in one or more regression parameters. We compare the performance of this method to that

of the most effective Phase I linear profile control chart approaches using a simulation study. The advantages of the change point method over the existing methods are greatly improved detection of sustained step changes in the process parameters and improved diagnostic tools to determine the sources of profile variation and the location(s) of the change point(s). Also, we give an approximation for appropriate thresholds for the test statistic. The use of the change point method is demonstrated using a data set from a calibration application at National Aeronautics and Space Administration (NASA) Langley Research Center.

Author

*Regression Analysis; Linearity; Mathematical Models; Segments*

**20080002135** Army Research Development and Engineering Command, Warren, MI USA

**Math-Based Simulation Tools and Methods**

Arepally, Sudhakar; Oct 10, 2007; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473213; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473213>

These briefing charts review numerous mathematical methods for simulating crashworthiness and occupant protection in motor vehicles. The following methods are reviewed: matrix operations, ordinary and partial differential system of equations, Lagrangian operations, Fourier transforms, Taylor Series, Finite Difference Methods, implicit and explicit finite element methods, and statistical methods (probabilistic and regression analysis). The slides are labeled as follows: HMMWV 30-mph Rollover Test, Soldier Gear Effects, Occupant Performance in Blast Effects, Anthropomorphic Test Device, Human Models, Rigid Body Modeling, Finite Element Methods, Injury Criteria Development, and Optimization.

DTIC

*Combat; Computerized Simulation; Human Body; Models; Motor Vehicles*

**20080002146** Defence Research and Development Suffield, Suffield, Alberta Canada

**Technical Description of Urban Microscale Modeling System: Component 1 of CRTI Project 02-0093RD**

Yee, Eugene; Lien, Fue-Sang; Ji, Hua; Mar 2007; 60 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473089; DRDC-TR-2007-067; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473089>

This report provides a technical description of the models that comprise Component 1 of a 4-year Chemical, Biological, Radiological and Nuclear Research and Technology Initiative (CRTI) Project 02-0093RD entitled 'An Advanced Emergency Response System for Chemical Biological Radiological and Nuclear (CBRN) Hazard Prediction and Assessment for the Urban Environment' whose primary objective is the development of an advanced, fully validated, state-of-the-science modeling system for the prediction of urban flow (i.e., turbulent flow through cities) and the concomitant problem of modeling the dispersion of CBRN agents released in a populated urban environment. The principal module of Component 1 is urbanSTREAM, which is a general second-order accurate finite volume code designed for the simulation of urban flow using a two equation turbulence closure model (namely, the standard kappa-EPSILON model and the limited-length-scale kappa-EPSILON model). Component 1 also incorporates a module (urbanGRID) for the automatic generation of grids in the computational domain when provided with detailed geometric information on the shapes and locations of buildings in the urban environment in the form of Environmental Systems Research Institute (ESRI) Shapefiles. Finally, Component 1 also includes modules for the prediction of urban dispersion in the Eulerian framework: namely, urbanEU which is an Eulerian grid dispersion model based on numerical solution of a KAPPA-theory advection-diffusion equation (source-oriented approach) and urbanAEU which is a receptor-oriented dispersion model based on numerical solution of the adjoint of the KAPPA-theory advection-diffusion equation.

DTIC

*Biological Weapons; Chemical Warfare; Cities; Models; Radiology; Urban Research; Warfare*

**20080002373** Army Natick Research and Development Command, MA USA

**Finite Element Modeling of Army Airbeam Structures**

Sartee, Karen; May 4, 2005; 20 pp.; In English

Report No.(s): AD-A473541; MIL-C-44154B; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473541>

Brief Overview of Airbeams, Engineering Process, Modeling Approaches, Fabric Airbeam Models, Modeling Technical

Barrier, Cavity Filled Membrane Models, Airbeam and Fabric Membrane Models, Application of Modeling, Center of Excellence, Current Small Business Innovative Research Projects  
DTIC

*Finite Element Method; Mathematical Models*

**20080002413** Vermont Univ., Burlington, VT USA

**A Research Program on the Asymptotic Description of Electromagnetic Pulse Propagation in Spatially Inhomogeneous Temporally Dispersive, Attenuative Media**

Oughstun, Kurt E; Sep 2007; 41 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0447; Proj-5094

Report No.(s): AD-A473605; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473605>

The results of this analysis have direct, meaningful application to the analysis and design of low-observable surfaces (for stealth airframes) and ultra-wideband radar systems (for observing stealth airframes), the remote detection of buried structures (such as land-mines and IED's), ionospheric pulse propagation (for remote sensing from an orbiting satellite), as well as the problem of ultra-wideband electromagnetic pulse exposure of biological tissues. Of further interest is the application of this theory to undersea communications systems, terahertz optical communication and integrated optics systems, and the remote sensing of geophysical structures.

DTIC

*Dispersing; Electromagnetic Pulses; Electromagnetic Wave Transmission*

**20080002425** Queensland Univ., Saint Lucia, Australia

**Human Resource Scheduling in Performing a Sequence of Discrete Responses**

Remington, Roger W; Wu, Shu-Chieh; Pashler, Harold; Feb 2007; 6 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0219

Report No.(s): AD-A473629; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473629>

The proposal had three original objectives: (1) extension of central bottleneck models as the basis for computational models of sequence behavior, (2) emergent properties in scheduling behavioral sequences; and (3) optimising performance in sequence behavior. The objectives have broadened to include reinforcement learning in sampling spatially distributed probabilistic information sources. Not only is variability in the spatial distribution of information a central feature of many military environments (e.g., radar operations), its study will also serve as the foundation for generalizing results with linear scan paths characteristic of reading to fully 2-dimensional scans characteristic of knowledge intensive tasks, such as radar operations.

DTIC

*Human Resources; Responses; Scheduling; Sequencing*

**20080002426** Minnesota Univ., Minneapolis, MN USA

**Computational Electromagnetics**

Reitich, Fernando L; Apr 2007; 15 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0019

Report No.(s): AD-A473630; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473630>

Progress in the development of fast, error-controllable algorithms for the simulation of electromagnetic scattering throughout the frequency spectrum is reported. Advances are described in the development of (1) accelerated, high-order methods for the solution of general, penetrable scattering problems in the low-to-moderate frequency regime; (2) spectral methods for the solution of approximate high-frequency models (geometrical optics -GO-); and (3) general error-controllable high-frequency scattering solvers. Major accomplishments include the completion of work on (1) in relation with scalar scattering models and the extension of the algorithms to vector models and composite backgrounds; the design, implementation and refinement of a spectral/discontinuous Galerkin method to resolve the GO model in phase space; the advancement of a spectral inverse ray-tracing approach; the development of methods for the evaluation of high-frequency scattering off composite rough surfaces; the derivation of general high-frequency scattering solvers applicable to both single- and multiple-scattering configurations consisting of bounded obstacles in two and three dimensions; and the analysis and

implementation of strategies to account for and accelerate the evaluation of multiple-scattering effects.  
DTIC

*Computational Electromagnetics; Electromagnetic Scattering; High Frequencies*

**20080002536** RAND Corp., Santa Monica, CA USA

**Games of Strategy: Theory and Applications**

Dresher, Melvin; Jan 1961; 197 pp.; In English

Report No.(s): AD-A473407; RAND/CB-149-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

'Games of Strategy: Theory and Applications,' originally published by Prentice Hall in 1961, was written by Melvin Dresher, a RAND research mathematician, during the heyday of Game Theory at RAND. This book introduced readers to the basic concepts of game theory and its applications for military, economic, and political problems, as well as its usefulness in decision making in business, operations research, and behavioral science. More than 40 years after its first publication as a RAND research study, and to celebrate RAND's 60th Anniversary, RAND brings this classic work back into print in paperback and digital formats. The author presents in an elementary and formal manner the mathematical theory of games of strategy and some of its applications. Although many of the applications are discussed in military terms, they can easily be formulated in economic or social science terms. An attempt has been made to develop the subject matter in such a way as to make the volume adaptable as a text on the theory of games in colleges and universities. The book starts in Chapter 1 with an exposition of games of strategy, with examples taken from parlor games as well as from military games. The next two chapters treat the basic topics in the theory of finite games (i.e., the existence of optimal strategies and their properties). Chapters 4 and 5 deal with the representation of games and the computation of optimal strategies. Since many games involve an infinite number of strategies, Chapters 6, 7, and 8 deal with such games by developing the necessary mathematics (e.g., probability distribution functions and Stieltjes integrals) for handling infinite games. The results on infinite games are applied in Chapters 9 and 10 to two general classes of games -- timing games and tactical games. Finally, the last chapter provides an application of moment space theory to the solution of infinite games.

DTIC

*Decision Making; Game Theory; Games; War Games*

**20080002547** California Univ., Berkeley, CA USA

**On Lagrangian Meshless Methods in Free-Surface Flows**

Silverberg, Jon P; Jan 2005; 73 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473689; CMML-2005-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Classically, fluid dynamics have been dealt with analytically because of the lack of numerical resources (Yeung, 1982). With the development of computational ability, many formulations have been developed which typically use the traditional Navier-Stokes equations along with an Eulerian grid. Today, there exists the possibility of using a moving grid (Lagrangian) along with a meshless discretization. The first issue in meshless fluid dynamics is the equations of motion. There are currently two types of Lagrangian formulations. Spherical Particle Hydrodynamics (SPH) is a method which calculates all equations of motion explicitly. The Moving Particle Semi-implicit (MPS) method uses a mathematical foundation based on SPH. However, instead of calculating all laws of motion explicitly, a fractional time step is performed to calculate pressure. A proposed method, Lagrange Implicit Fraction Step (LIFS), has been created which improves the mathematical formulations on the fluid domain. The LIFS method returns to Continuum mechanics to construct the laws of motion based on decomposing all forces of a volume. It is assumed that all forces on this volume can be linearly superposed to calculate the accelerations of each mass. The LIFS method calculates pressure from a boundary value problem with the inclusion of proper flux boundary conditions. The second issue in meshless Lagrangian dynamics is the calculation of derivatives across a domain. The Monte Carlo Integration (MCI) method uses weighted averages to calculate operators. However, the MCI method can be very inaccurate, and is not suitable for sparse grids. The Radial Basis Function (RBF) method is introduced and studied as a possibility to calculate meshless operators. The RBF method involves a solution of a system of equations to calculate interpolants. Machine expenses are shown to limit the viability of the RBF method for large domains.

DTIC

*Free Flow; Lagrangian Function*

**20080002643** Army Engineer Research and Development Center, Vicksburg, MS USA

**A Primer for the Linkage Between Unstructured Water Quality Model CE-QUAL-ICM and Structured Three-Dimensional Hydrodynamic Model CH3D-WES**

Kim, Sung-Chan; Oct 2007; 59 pp.; In English

Report No.(s): AD-A473837; ERDC-WQ-TN-AM-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Water Quality Research Program (WQRP) Technical Note (TN) describes the linkages between water quality model CE-QUAL-ICM (ICM) and three-dimensional hydrodynamic model CH3D-WES: CH3D. This TN also presents a primer for the linkages through a set of MATLAB programs. The created linkage files enable seamless operation from CH3D to ICM. DTIC

*Cartesian Coordinates; Hydrodynamics; Linkages; Three Dimensional Models; Water Quality*

**20080002644** Clemson Univ., SC USA

**A Fractional Step Theta-Method for Viscoelastic Fluid Flow Using a UPG Approximation**

Chrispell, J C; Ervin, V J; Jenkins, E W; Oct 2007; 101 pp.; In English

Contract(s)/Grant(s): DMS-0410792; W911NF-05-1-0380

Report No.(s): AD-A473838; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this article a fractional step theta-method is described and studied for the approximation of time dependent viscoelastic fluid flow equations, using the Johnson-Segalman constitutive model. The theta-method implementation allows the velocity and pressure approximations to be decoupled from the stress, reducing the number of unknowns resolved at each step of the method. The constitutive equation is stabilized using a Streamline Upwinded Petrov-Galerkin 'SUPG'-method. A priori error estimates are given for the approximation scheme. Numerical computations supporting the theoretical results and demonstrating the theta-method are also presented.

DTIC

*Fluid Flow; Viscoelasticity*

**20080002649** Illinois Univ., Chicago, IL USA

**Narrow Gap HgCdTe Absorption Behavior Near the Band Edge Including Nonparabolicity and the Urbach Tail (Postprint)**

Guha, Shekhar; Chang, Yong; Flatte, M E; Nathan, V; Aug 10, 2006; 6 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473846; AFRL-ML-WP-TP-2007-552; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An analytical model describing the absorption behavior of HgCdTe is developed that simultaneously considers the contributions from nonparabolic conduction and light hole bands as calculated by a 14 x 14 matrix k- p method as well as the Urbach tail. This model is capable of smoothly fitting experimental absorption coefficient curves over energies ranging from the Urbach tail region to the intrinsic absorption region up to 300 meV above the band gap. Comparisons to the experimental results give good agreement.

DTIC

*Absorption Spectra; Absorptivity; Energy Gaps (Solid State); Mercury Cadmium Tellurides*

**65**

**STATISTICS AND PROBABILITY**

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

**20080000543** Air Force Research Lab., Hanscom AFB, MA USA

**Statistical Characteristics of Microwave Signals Scattered from a Randomly Rough Surface**

Mudaliar, Saba; Sep 14, 2007; 6 pp.; In English

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A472296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper is an investigation of the statistical characteristics of the amplitude of signals scattered from a randomly rough surface. When the area of illumination and the grazing angles are large the amplitude of scattered signals are found to obey Rayleigh statistics. On the other hand, when the grazing angles are very small and the resolution size is small it has been found Lognormal statistics form a good fit. However, in the intermediate domain we find that no particular distribution has overall



best fit. The conclusion is based on a statistical analysis of the simulated data generated by rigorous rough surface scattering analysis along with Monte Carlo simulation of sample surfaces. The scattering calculations are based on integral equation formulation of scattering and are solved using method of moments.

DTIC

*Microwaves; Statistical Analysis*

**2008000554** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Search Techniques for Multi-Objective Optimization of Mixed-Variable Systems Having Stochastic Responses**

Walston, Jennifer G; Sep 2007; 153 pp.; In English

Report No.(s): AD-A472308; AFIT/DS/ENS/07S-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A research approach is presented for solving stochastic, multi-objective optimization problems. First, the class of mesh adaptive direct search (MADS) algorithms for nonlinearly constrained optimization is extended to mixed variable problems. The resulting algorithm, MV-MADS, is then extended to stochastic problems (MVMADS-RS), via a ranking and selection procedure. Finally, a two-stage method is developed that combines the generalized pattern search/ranking and selection (MGPS-RS) algorithms for single-objective, mixed variable, stochastic problems with a multi-objective approach that makes use of interactive techniques for the specification of aspiration and reservation levels, scalarization functions, and multi-objective ranking and selection. A convergence analysis for the general class of algorithms establishes almost sure convergence of an iteration subsequence to stationary points appropriately defined in the mixed-variable domain. Seven specific instances of the new algorithm are implemented and tested on 11 multi-objective test problems from the literature and an engineering design problem.

DTIC

*Optimization; Search Profiles; Stochastic Processes*

**2008000624** Army Command and General Staff Coll., Fort Leavenworth, KS USA

**The Other End of the Spear: The Tooth-to-Tail Ratio (T3R) in Modern Military Operations**

McGrath, John J; Jan 2007; 124 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472467; No Copyright; Avail.: Defense Technical Information Center (DTIC)

John McGrath's 'The Other End of the Spear' is a timely historical analysis and an important follow-on work to his earlier analysis of troop density trends in CSI Occasional Paper 16, 'Boots on the Ground.' 'Boots on the Ground' analyzed the ratio between the numbers of troops employed in military operations relative to the population in a number of irregular conflicts. This study analyzes the composition of such forces to answer the question: what have been the historical trends in the ratio of deployed forces directly engaged in fighting, relative to those engaged in noncombat functions? This ratio is commonly, if inaccurately, called the tooth-to-tail ratio. McGrath's study finds that the tooth-to-tail ratio, among types of deployed US forces, has steadily declined since World War II, just as the nature of warfare itself has changed. At the same time, the percentage of deployed forces devoted to logistics functions and to base and life support functions have both increased, especially with the advent of the large-scale use of civilian contractors. This work, coupled with 'Boots on the Ground,' provides a unique analysis of the size and composition of military forces as found in historical patterns. Policy makers, commanders, and staff officers should use these two studies as a basis from which to begin their analysis of the particular campaign at hand. They will then need to apply their understanding of the objectives, the nature of the conflict, and local and regional culture and conditions to the analysis to create a winning military plan. The practice of war contains a strong element of science, but in the end, the practice of war is an art. This study cannot be used to guarantee victory simply by composing a force of the proportional figures presented in the conclusion. However, it does provide a good baseline, based on historical precedent, for future planning.

DTIC

*Military Operations; Planning; Quantitative Analysis*

**2008000633** Zhejiang Univ., China

**Theoretical Analysis of Image Processing Using Parameter-Tuning Stochastic Resonance Technique**

Xu, Bohou; Wu, Xingxing; Jiang, Zhong-Ping; Repperger, Daniel W; Sep 2006; 8 pp.; In English

Contract(s)/Grant(s): Proj-2313

Report No.(s): AD-A472486; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Parameter-tuning stochastic resonance (PSR) technique provides a new approach for signal processing. This paper will first fill the gap in the performance analysis of the nonlinear PSR-based detector by comparing it with the matched filter

detector by comparing it with the matched filter detector under both ideal conditions (white Gaussian noise, and perfect synchronization) and no-ideal conditions (colored noise, desynchronization, and low sampling rate) to identify its strengths and weaknesses.

DTIC

*Image Processing; Resonance; Signal Processing; Stochastic Processes; Tuning*

**2008000638** Air Force Research Lab., Kirkland AFB, NM USA

**Biased Cramer-Rao Lower Bound Calculations for Inequality-Constrained Estimators (Preprint)**

Matson, Charles; Haji, Alim; Sep 1, 2006; 12 pp.; In English

Contract(s)/Grant(s): F29601-01-D-0083-0006; Proj-D0D0

Report No.(s): AD-A472497; AFRL-DE-PS-JA-2007-1011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Unbiased Cramer-Rao lower bound (CRB) theory can be used to calculate lower bounds to the variances of unbiased estimates of a set of parameters given only the probability density function of a random vector conditioned on the true parameter values. However, when the estimated parameter values are required to satisfy inequality constraints such as positivity, the resulting estimator is typically biased. To calculate CRBs for biased estimates of the parameter values, an expression for the bias gradient matrix must also be known. Unfortunately, this expression often does not exist. Because expressions for biased CRBs are preferable to sample variances calculations, alternate methods for deriving biased CRB expressions associated with inequality constraints are needed. Here we present an alternate approach that is biased upon creating the probability density function associated with a given biased estimate of these parameters using the available knowledge of estimator properties. We apply this approach to the calculations of biased CRBs for estimators that use a positivity constraint for a specific measurement model and discuss the benefits and limitations of this approach.

DTIC

*Bias; Cramer-Rao Bounds; Estimates; Inequalities; Probability Density Functions*

**2008000799** Defence Science and Technology Organisation, Victoria, Australia

**Radiological Source Localisation**

Gunatilaka, Ajith; Ristic, Branko; Gailis, Ralph; Jul 2007; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A471550; DSTO-TR-1988; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The increasing threat of chemical, biological, and radiological (CBR) attacks has resulted in a significant interest in research on countering such attacks. This research focuses on countering radiological attacks, which may, for example, be carried out using radiological dispersion devices or dirty bombs. The ability to rapidly localize a radiological source can assist emergency responders to disable, isolate, or safely remove such a device. This report describes some preliminary work the authors have carried out in the area of radiological source modeling and localization. This work concerned localization of a single fixed gamma radiation source of unknown activity level. The accuracy with which the source location and the activity could be estimated was studied using the Cramer-Rao bound analysis. A simple deterministic analytical approach as well as several probabilistic estimation techniques were investigated using simulated and real measurement data. The inverse square law-based deterministic solution developed in this work uses radiation measurements collected at four arbitrary points to estimate the source position and activity. This algorithm was able to provide reasonable source estimates based on real data collected using the Low Cost Advanced Airborne Radiological Survey (LCAARS) system developed by DSTO. The maximum likelihood estimator and a nonlinear least squares estimator yielded quite accurate estimates. While the maximum likelihood is an asymptotically efficient estimator, it is a batch algorithm and is unattractive for operational use. An inexact recursive least squares algorithm was developed and it produced good estimates when applied to real data. Unscented Kalman filter (UKF) and extended Kalman filter (EKF) algorithms also were investigated. The UKF approach performed well but the EKF was divergent and could not return acceptable source estimates.

DTIC

*Cramer-Rao Bounds; Estimates; Gamma Rays; Kalman Filters; Least Squares Method; Maximum Likelihood Estimates; Position (Location); Radiology; Warfare*

**20080001230** California Univ., Berkeley, CA USA

**Coverage Adjusted Entropy Estimation**

Vu, Vincent Q; Yu, Bin; Kass, Robert E; Jun 5, 2007; 32 pp.; In English

Contract(s)/Grant(s): W911NF-05-1-0104

Report No.(s): AD-A472999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Data on 'neural coding' have frequently been analyzed using information-theoretic measures. These formulations involve

the fundamental, and generally difficult statistical problem of estimating entropy. We review briefly several methods that have been advanced to estimate entropy, and highlight a method, the coverage adjusted entropy estimator (CAE), due to Chao and Shen that appeared recently in the environmental statistics literature. This method begins with the elementary Horvitz-Thompson estimator, developed for sampling from a finite population and adjusts for the potential new species that have not yet been observed in the sample - these become the new patterns or 'words' in a spike train that have not yet been observed. The adjustment is due to I.J. Good, and is called the Good-Turing coverage estimate. We provide a new empirical regularization derivation of the coverage-adjusted probability estimator, which shrinks the MLE. We prove that the CAE is consistent and first-order optimal, with rate  $O(p^{-1}/\log n)$ , in the class of distributions with finite entropy variance and that within the class of distributions with finite  $q$ th moment of the log-likelihood, the Good-Turing coverage estimate and the total probability of unobserved words converge at rate  $O(p^{-1}/(\log n)^q)$ . We then provide a simulation study of the estimator with standard distributions and examples from neuronal data, where observations are dependent. The results show that, with a minor modification, the CAE performs much better than the MLE and is better than the Best Upper Bound estimator, due to Paninski, when the number of possible words  $m$  is unknown or infinite.

DTIC

*Entropy; Neurology; Statistical Analysis*

**20080001444** Massachusetts Univ., Amherst, MA USA

**Autocorrelation and Relational Learning: Challenges and Opportunities**

Neville, Jennifer; Simsek, Ozgur; Jensen, David; Jan 2004; 9 pp.; In English

Contract(s)/Grant(s): F30602-00-2-0597; EIA9983215

Report No.(s): AD-A472226; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472226>

Autocorrelation, a common characteristic of many datasets, refers to correlation between values of the same variable on related objects. It violates the critical assumption of instance independence that underlies most conventional models. In this paper, we provide an overview of research on autocorrelation in a number of fields with an emphasis on implications for relational learning, and outline a number of challenges and opportunities for model learning and inference.

DTIC

*Autocorrelation; Inference*

**20080001506** Defence Research and Development Suffield, Suffield, Alberta Canada

**Bayesian Inversion of Concentration Data for an Unknown Number of Contaminant Sources**

Yee, Eugene; Jun 2007; 58 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472780; DRDC-SUFFIED-TR2007-085; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we address the inverse problem of source reconstruction for the difficult case of multiple sources when the number of sources is unknown a priori. The problem is solved using a Bayesian probabilistic inferential framework in which Bayesian probability theory is used to derive the posterior probability density function for the number of sources and for the parameters (e.g., location, emission rate, release duration) that characterize each source. A mapping (or, source receptor relationship) that relates a multiple source distribution to the concentration data measured by the array of sensors is formulated based on a forward-time Lagrangian stochastic model. A computationally efficient methodology for determination of the likelihood function for the problem, based on an adjoint representation of the source receptor relationship and realized in terms of a backward-time Lagrangian stochastic model, is described. An efficient computational algorithm based on a reversible jump Markov chain Monte Carlo (MCMC) method is formulated and implemented to draw samples from the posterior density function of the source parameters. This methodology allows the MCMC method to jump between the hypothesis spaces corresponding to different numbers of sources in the source distribution and, thereby, allows a sample from the full joint posterior distribution of the number of sources and source parameters to be obtained. The proposed methodology for source reconstruction is tested using synthetic concentration data generated for cases involving two and three unknown sources.

DTIC

*Bayes Theorem; Contaminants; Inversions; Markov Processes; Monte Carlo Method; Probability Density Functions*

**20080001527** California Univ., Berkeley, CA USA

**Lasso-type recovery of sparse representations for high-dimensional data**

Meinshausen, Nicolai; Yu, Bin; Dec 5, 2006; 32 pp.; In English

Contract(s)/Grant(s): W911NF-05-1-0104

Report No.(s): AD-A472998; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Lasso (Tibshirani, 1996) is an attractive technique for regularization and variable selection for high-dimensional data, where the number of predictor variables  $p$  is potentially much larger than the number of samples  $n$ . However, it was recently discovered (Zhao and Yu, 2006; Zou, 2005; Meinshausen and Bühlmann, 2006) that the sparsity pattern of the Lasso estimator can only be asymptotically identical to the true sparsity pattern if the design matrix satisfies the so-called irrepresentable condition. The latter condition can easily be violated in applications due to the presence of highly correlated variables. Here we examine the behavior of the Lasso estimators if the irrepresentable condition is relaxed. Even though the Lasso cannot recover the correct sparsity pattern, we show that the estimator is still consistent in the  $l_2$ -norm sense for fixed designs under conditions on (a) the number  $s$  of non-zero components of the vector  $\beta$  and (b) the minimal singular values of the design matrices that are induced by selecting of order  $s$  variables. The results are extended to vectors  $\beta$  in weak  $l_q$ -balls with  $0 < q < 1$ . Our results imply that, with high probability, all important variables are selected. The set of selected variables is a useful (meaningful) reduction on the original set of variables. Finally, our results are illustrated with the detection of closely adjacent frequencies, a problem encountered in astrophysics.

DTIC

*Mathematical Models; Astrophysics; Probability Theory*

**20080001671** California Univ., Berkeley, CA USA

**Boosted Lasso**

Zhao, Peng; Yu, Bin; Dec 2004; 22 pp.; In English

Contract(s)/Grant(s): DAAD19-01-1-0643

Report No.(s): AD-A473146; UCB-STATS-678; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473146>

In this paper, we propose the Boosted Lasso (BLasso) algorithm that is able to produce an approximation to the complete regularization path for general Lasso problems. BLasso is derived as a coordinate descent method with a fixed small step size applied to the general Lasso loss function ( $l_1$  penalized convex loss). It consists of both a forward step and a backward step and uses differences of functions instead of gradient. The forward step is similar to Boosting and Forward Stagewise Fitting, but the backward step is new and crucial for BLasso to approximate the Lasso path in all situations. For cases with finite number of base learners, when the step size goes to zero, the BLasso path is shown to converge to the Lasso path. For nonparametric learning problems with a large or an infinite number of base learners, BLasso remains valid since its forward steps are Boosting steps and its backward steps only involve the base learners that are included in the model from previous iterations. Experimental results are also provided to demonstrate the difference between BLasso and Boosting or Forward Stagewise Fitting. In addition, we extend BLasso to the case of a general convex loss penalized by a general convex function and illustrate this extended BLasso with examples.

DTIC

*Mathematical Models; Regression Analysis*

**20080001902** Naval Postgraduate School, Monterey, CA USA

**An Analysis of Learning Algorithms in Complex Stochastic Environments**

Poor, Kristopher D; Jun 2007; 65 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As the military continues to expand its use of intelligent agents in a variety of operational aspects, event prediction and learning algorithms are becoming more and more important. In this paper, we conduct a detailed analysis of two such algorithms: Variable Order Markov and Look-Up Table models. Each model employs different parameters for prediction and this study attempts to determine which model is more accurate in its prediction and why. We find the models contrast in that the Variable Order Markov Model increases its average prediction probability, our primary performance measure, with increased maximum model order, while the Look-Up Table Model decreases average prediction probability with increased recency time threshold. In addition, statistical tests of results of each model indicate a consistency in each model's prediction capabilities, and most of the variation in the results could be explained by model parameters.

DTIC

*Algorithms; Machine Learning; Stochastic Processes*

**20080001960** Naval Postgraduate School, Monterey, CA USA

**Sensor Failure Detection through Introspection**

Smeltz, Jeremy; Valerius, Andrew; Jun 2007; 57 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473472; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The advancement of robot technology holds many opportunities for military applications. One area of research being done is simultaneous localization and mapping (SLAM). SLAM uses a robot's sensors to generate a map of the area while maintaining its current position within that map. SLAM research is built upon the assumption that all of the sensors are working correctly. Since field conditions are likely to cause erratic sensor function due to damage or inclement weather conditions, this assumption must be addressed. The goal of our research is to discover methods of effectively performing self-diagnostic checks on robots to detect failures and malfunctions in sensors. There has been little work in the area of error detection in sensors, and what little work has been done has limited applications. This thesis will perform a series of experiments using a variety of different error detection techniques. It is our hope that the methods developed will prove to be applicable to a variety of real world systems.

DTIC

*Detection; Errors; Failure; Robots*

**20080002264** NASA Langley Research Center, Hampton, VA, USA

**Propagation of Computational Uncertainty Using the Modern Design of Experiments**

DeLoach, Richard; December 03, 2007; 35 pp.; In English; NATO-RTO AVT-147 Symposium on Computational Uncertainty in Military Vehicle Design, 3-6 Dec. 2007, Athens, Greece; Original contains color and black and white illustrations  
Contract(s)/Grant(s): WBS 478076.07.80; No Copyright; Avail.: CASI: A03, Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080002264>

This paper describes the use of formally designed experiments to aid in the error analysis of a computational experiment. A method is described by which the underlying code is approximated with relatively low-order polynomial graduating functions represented by truncated Taylor series approximations to the true underlying response function. A resource-minimal approach is outlined by which such graduating functions can be estimated from a minimum number of case runs of the underlying computational code. Certain practical considerations are discussed, including ways and means of coping with high-order response functions. The distributional properties of prediction residuals are presented and discussed. A practical method is presented for quantifying that component of the prediction uncertainty of a computational code that can be attributed to imperfect knowledge of independent variable levels. This method is illustrated with a recent assessment of uncertainty in computational estimates of Space Shuttle thermal and structural reentry loads attributable to ice and foam debris impact on ascent.

Author

*Computer Programs; Error Analysis; Experiment Design; Independent Variables; Uncertain Systems*

**20080002354** Starfire Industries, LLC, Champaign, IL USA

**Hall Thruster Electron Mobility Investigation using Full 3D Monte Carlo Trajectory Simulations (Preprint)**

Alman, Darren A; Rovey, Joshua L; Stubbers, Robert A; Jurczyk, Brian E; Aug 24, 2007; 7 pp.; In English  
Contract(s)/Grant(s): Proj-22SO  
Report No.(s): AD-A473505; AFRL-PR-ED-TP-2007-392; IEPC-2007-291; No Copyright; Avail.: Defense Technical Information Center (DTIC)  
ONLINE: <http://hdl.handle.net/100.2/ADA473505>

Axial electron transport represents a loss in efficiency for crossed field devices, such as Hall-effect thrusters (HETs). Previous experimental and computational investigations have revealed an anomalous axial mobility that cannot be explained with classical theory. This work describes the development of a computational model that calculates electron mobility in HETs using known electric and magnetic fields. Specifically, a full 3D Monte Carlo trajectory simulation code is developed to simulate HET internal electron dynamics. Simulations were completed using the AFRL/University of Michigan P5 HET. The magnetic field for this thruster is known from magnetostatic simulations and the electric field present during thruster operation has been experimentally measured by Haas. Comparison of the axial mobility from our code and the mobility calculated by Koo for the P5 shows agreement.

DTIC

*Electron Mobility; Hall Effect; Hall Thrusters; Monte Carlo Method; Particle Trajectories; Trajectories*

**20080002379** Moncrief Army Community Hospital, Fort Jackson, SC USA

**Analysis of the Impact of the Armed Forces Health Longitudinal Technology Application (AHLTA) on Ambulatory Data Module and Coding Compliance and Provider Productivity at Moncrief Army Community Hospital**

Hamlin, Cerise R; Apr 2006; 34 pp.; In English

Report No.(s): AD-A473549; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473549>

This study examined the effects of the Armed Forces Health Longitudinal Technology Application (AHLTA) implementation on Ambulatory Data Module (ADM) compliance, coding compliance, and provider productivity. The sample sized consisted of the 24 months of data The AHLTA system is an electronic medical record designed to improve patient care delivery in the military health system. A statistical analysis of the implementation of the AHLTA system on coding compliance and provider productivity showed positive statistical significant results ( $r = .165$ , and  $p = .000$ ) and ( $r = -.216$ , and  $p = .022$ ) respectively. There was no statistical correlation between AHLTA implementation and ADM compliance.

DTIC

*Ambulances; Armed Forces; Coding; Health; Hospitals; Medical Services; Productivity; Statistical Analysis; Technology Utilization*

**20080002423** Texas A&M Univ., College Station, TX USA

**Geometric Methods for ATR: Shape Spaces, Metrics, Object/Image Relations, and Shapelets**

Stiller, Peter F; Sep 30, 2007; 64 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0302

Report No.(s): AD-A473624; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473624>

This report details our recent progress (1 Sept. 2006 to 30 Sept. 2007) and summarizes the work done over the entire 40 months of the project. It outlines our recent success in creating the first 'global object/image equations and metrics for the full perspective case, and it discusses some of the additional experimental testing we did to verify the robustness of our algorithms. We extended our analysis of the relationship between the shape spaces for point features under similarity transformations and those under the affine group. The former are relevant to orthographic sensors (radar) and the later arise when dealing with weak perspective sensors (optical - far field). Understanding the relationship between the two types of shape spaces facilitates fusing data from these two types of sensors. In addition, we worked on global embeddings of the shape spaces in the orthographic (radar) case, and we continued to work on metrics for the case where the features are taken as unordered collections of points. Currently, we are working on the 3D reconstruction problem, especially shape from motion and have started to look at advanced statistical/noise issues.

DTIC

*Geometry; Shapes; Statistics; Target Recognition*

66

**SYSTEMS ANALYSIS AND OPERATIONS RESEARCH**

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

**20080000364** Army Tank-Automotive Research and Development Command, Warren, MI USA

**Pendulum Walker**

Muench, Paul; Marecki, Alexander; Mar 11, 2007; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472148; TARDEC-17037; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472148>

Picture someone walking from left to right. During one step (intra-step) we treat them as a simple pendulum. This model is called the rimless wheel in the literature. We analyze this model intra-step using dynamic programming to find the optimum energy profile based on time and energy cost. We then analyze the problem inter-step for the ideal stepsize based on time cost alone, i.e., without foot collision (energy) losses.

DTIC

*Dynamic Programming; Optimization; Pendulums; Walking*

**20080000408** Edith Cowan Univ., Perth, Australia

**Making Information Operations Effects-Based: Begin with the End (-State) in Mind!**

Duczynski, Guy; Apr 2005; 60 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472241; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472241>

No abstract available

*Military Operations; Planning; Strategy*

**20080000410** Whitney Bradley and Brown, Inc., Virginia Beach, VA USA

**Providing Analysis Support in the Early Stages of Military Concept Development**

Gregg, Robert J; Apr 1, 2005; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472244; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472244>

No abstract available

*Operations Research; Systems Engineering*

**20080000549** Air Force Research Lab., Hanscom AFB, MA USA

**Neural Dynamic Logic of Consciousness: The Knowledge Instinct**

Perlovsky, Leonid I; Sep 7, 2007; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4916

Report No.(s): AD-A472303; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report discusses the evolution of consciousness driven by the knowledge instinct, a fundamental mechanism of the mind which determines its higher cognitive functions and neural dynamics. We discuss mathematical difficulties encountered in the past attempts at modeling the mind and relate them to logic. Neural modeling fields and dynamic logic mathematically describe these mechanisms and relate their neural dynamics to the knowledge instinct. Dynamic logic overcomes past mathematical difficulties encountered in modeling intelligence. Mathematical mechanisms of concepts, emotions, instincts, consciousness and unconscious are described and related to perception and cognition. The two main aspects of the knowledge instinct are differentiation and synthesis. Differentiation is driven by dynamic logic and proceeds from vague and unconscious states to more crisp and conscious states, from less knowledge to more knowledge at each hierarchical level of the mind. Synthesis is driven by a hierarchical organization of the mind; it strives to achieve unity and meaning of knowledge: every concept finds its deeper and more general meaning at a higher level. These mechanisms are in complex relationship of symbiosis and opposition, and lead to complex dynamics of evolution of consciousness and cultures. Mathematical modeling of this dynamics in a population leads to predictions for the evolution of consciousness, and cultures. Cultural predictive models can be compared to experimental data and used for improvement of human conditions. We discuss existing evidence and future research directions.

DTIC

*Cognition; Mathematical Models; Nervous System; Neural Nets*

**20080000614** Military Operations Research Society, Alexandria, VA USA

**Analysis for Non-Traditional Security Challenges: Methods and Tools**

Dick, Lee; Harris, Jim; Nov 20, 2006; 175 pp.; In English

Contract(s)/Grant(s): N00014-04-C-0092

Report No.(s): AD-A472447; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This publication is the report of the Analysis for Non-Traditional Security Challenges: Methods and Tools Workshop.

DTIC

*Security; Warfare*

**2008000963** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Ranged Integers for the C Programming Language**

Gennari, Jeff; Hedrick, Shaun; Long, Fred; Pincar, Justin; Seacord, Robert C; Sep 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472565; CMU/SEI-2007-TN-027; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472565>

This report describes an extension to the C programming language to introduce the notion of ranged integers, that is, integer types with a defined range of values. A variable of a ranged integer type will always have a value within the defined range as a result of initialization or assignment. Use of ranged integers would help prevent integer overflow errors and thus would result in more reliable and secure C programs. The syntax and semantics of ranged integers are presented, and some examples are given to illustrate their use.

DTIC

*C (Programming Language); Information Systems; Integers; Security*

**2008000994** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Modeling of System Families**

Feiler, Peter; Jul 2007; 55 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472620; CMU/SEI-2007-TN-047; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472620>

Over their lifetime, systems exist in many forms, such as instances of a system deployed in different contexts or a system evolving over time. Variability may also occur in terms of functionality reflected in the domain architecture, nonfunctional properties (such as performance, reliability, and safety-criticality) that are realized in the runtime architecture, interfaces to the deployment environment with which the system interfaces, and mapping to computing platforms. The Society of Automotive Engineers (SAE) Architecture Analysis & Design Language (AADL) is an industry-standard, architecture-modeling notation specifically designed to support a component-based approach to modeling embedded systems. This technical note discusses how AADL can be used to model system families and configurations of system and component variants. It shows that AADL supports system families by providing component types that are used to specify component interfaces and multiple implementations for each component type. This report also shows that AADL uses properties to represent multiple dimensions of system variability ranging from variation through conditional compilation to variation through different sets of calibration parameters.

DTIC

*Languages; Simulation; Systems Analysis*

**20080001147** University Coll., Dublin, Ireland

**Knowledge-Based Solutions as they Apply to the General Radar Problem**

Griffiths, H D; Sep 2006; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472791; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Clutter; Knowledge Based Systems*

**20080001175** Center for Naval Analyses, Alexandria, VA USA

**Organizational Analysis Primer: A Synthesis of CNA's Work**

Randazzo-Matsel, Annemarie; Aug 2007; 54 pp.; In English

Contract(s)/Grant(s): N00014-05-D-0500; Proj-R0148

Report No.(s): AD-A472881; CNA-CRM-D0016576.A1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Synthesis of Marine Corps Analysis study is a CNA-Initiated study designed to synthesize our approaches and findings in three key areas of CNA analysis: operational assessment, organizational analysis, and real-world operations. This is the second of three reports, and focuses on organizational analysis. The goal of organizational analysis is to determine those



structures that best meet the demands and requirements of and for a specific organization. CNA's approach to organizational analysis focuses on building an analytical foundation that can be used to determine whether a particular organizational structure is better-suited to meet the demands, requirements, and resources of an organization. CNA's predominant approach is a functions-based approach that focuses on 'form following function' and enables an organization to measure itself against specific responsibilities and objectives (what is required). It is not meant to represent a static approach. In more complex cases, we incorporate other approaches including process-analysis. Further, we expect that we will continue to refine and advance our approaches to these types of analysis.

DTIC

*Functional Analysis; Organizations*

**20080001197** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Using ArchE in the Classroom: One Experience**

McGregor, John D; Bachmann, Felix; Bass, Len; Bianco, Philip; Klein, Mark; Sep 2007; 43 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472934; CMU/SEI-2007-TN-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Architecture Expert (ArchE) tool serves as a software architecture design assistant. It embodies knowledge of quality attributes and the relation between the achievement of quality attribute requirements and architecture design. This technical note describes the use of a pre-alpha release of ArchE in a graduate-level software architecture class at Clemson University. ArchE was used to assist the students in the architecting process. The tool was then evaluated by the students and instructor. The instructor felt that ArchE met his objectives as a pedagogical tool. The students, although critical of the pre-alpha status of ArchE, were enthusiastic about the benefits of having the step-by-step guide to the architect's designing process as provided by ArchE.

DTIC

*Computer Programming; Software Development Tools; Software Engineering*

**20080001229** Humansystems, Inc., Guelph, Ontario Canada

**Systems Archetypes for Military Dynamic Decision Making (Archetypes de systemes pour une prise de decision dynamique dans le domaine militaire)**

Rehak, Lisa A; Lamoureux, Tabbeus M; Bos, Jeff C; Mar 2006; 64 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472996; DRDC-T-CR-2006-202; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The complex and dynamic nature of operations other than war (OOW) (e.g., peace support, the 3 block war concept) in which Canada and allied nations are increasingly involved requires Canadian Forces (CF) officers to call upon high level dynamic decision making (DDM) skills to an unprecedented degree, especially at the strategic and operational levels. One possible method of improving the DDM skills of CF personnel is the application of 'systems thinking', in particular, the possibility that a limited number of recurring patterns (archetypes) can be used to explain all military situations and thus aid DDM. If successful, this approach would enable the CF to achieve its objectives efficiently with minimal unexpected outcomes (e.g. second- and third-order effects). This work looked into the applicability of archetypes for training DDM, through analyzing and modeling military history scenarios. The applicability of existing archetypes is discussed along with suggestions concerning new archetypes that apply to military scenarios.

DTIC

*Decision Making; Military Operations; Models*

**20080001498** Naval Surface Warfare Center, Bethesda, MD USA

**Joint High Speed Sealift (JHSS) Baseline Shaft & Strut (BSS) Model 5653-3: Series 2, Propeller Disk LDV Wake Survey; and Series 3, Stock Propeller Powering and Stern Flap Evaluation Experiments**

Cusanelli, Dominic S; Chesnakas, Christopher J; Sep 2007; 121 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472907; NSWCCD-TR-2007-084; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Model 5653-3, scale ratio 34.121, is representative of the Joint High Speed Sealift (JHSS) conventional Baseline Shaft & Strut (BSS) hullform with Gooseneck Bulb (GB). This report documents the Propeller Disk LDV Wake Survey tests (Series 2) and Stock Propeller Powering and Stern Flap Evaluation tests (Series 3). In order to assist in the design of a propeller for the BSS hull, the nominal wakes in the inboard and outboard starboard propeller planes were measured using LDV. The

velocity fields were used to determine the average flow near the propeller tip in the event that ducted propellers or podded propulsors were to be designed for this hull. Harmonic content of nominal wake was calculated up to the 16th harmonic for both inner and outer shafts. The stock propeller powering prediction for the JHSS BSS GB configuration with stern flap installed, with SAD included, no power margin, non-cavitating propellers, at design (DES) displacement, indicates that at the 36 knot speed of interest the total delivered power required will be 149,440 hP (111,440 kw), and to attain the desired speed of 39 knots will require 218,180 hP (162,690 kw). This 39 knot speed is achievable within the expected total installed power for the JHSS BSS. The selected stern flap design for the JHSS BSS has full-scale dimensions of chord length 12.8ft (3.9m) equivalent to 1.35% LWL, span 52.9ft (16m) representing 80% of the maximum span, and an angle of 100 trailing edge down relative to the local buttock slope at the centerline of the transom. At DES displacement, the stern flap exhibited a reduction in required delivered power of 7.6% at the 36 knot optimization speed, and a reduction in propeller speed of 2.9 RPM.

DTIC

*Afterbodies; Evaluation; Flapping; High Speed; Propellers; Shafts (Machine Elements); Struts; Surveys; System Effectiveness; Wakes*

**20080001502** Military Academy, West Point, NY USA

**The Rapid Field Initiative Business Analysis**

Goerger, Simon R; Crino, Scott T; McCarthy, Daniel J; Griffin, Gregory; Jun 21, 2007; 67 pp.; In English

Report No.(s): AD-A472634; DSE-R-0716; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Army's Rapid Fielding Initiative (RFI) is the process by which new equipment is distributed to Soldiers either at home station or in a theater of operations. Currently equipment is shipped from over 50 suppliers around the USA to a single central warehouse on the east coast where it is packaged into sets. The sets are then shipped to the end user stationed at one of over 40 locations around the world. It is a process that costs the Army time money and a great deal of effort to execute. This case study examines the RFI supply chain and makes recommendations to improve the current inventory management system (IMS) by removing the communication gaps between the PM warehouse and suppliers; a location analysis is performed to select the most efficient and economic location for the warehouse and packaging facility; and a new tariff is proposed that will reduce the number of items shipped to and returned from each fielding location that better meets the needs of the Soldier. The recommendations are the result of applying a combination of Lean Six Sigma tools and the Systems Decision Process to determine the most efficient and economic solutions and provide the greatest value to the stakeholders.

DTIC

*Commerce; Inventory Controls; Inventory Management; Management Systems; Supplying*

**20080001533** Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese, Belgium

**Investigation of the Link between Physics and POD Modes**

Regert, T; Rambaud, P; Reithmuller, M L; Apr 2005; 13 pp.; In English

Report No.(s): AD-A471498; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Kinetic Energy; Pods (External Stores); Vortices*

**20080001593** Air Force Research Lab., Rome, NY USA

**Knowledge-Based Control for Space Time Adaptive Processing**

Wicks, Michael C; Sep 2006; 52 pp.; In English

Report No.(s): AD-A472794; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Knowledge Based Systems; Moving Target Indicators; Radar Tracking; Signal Processing; Space-Time Adaptive Processing*

**20080001630** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Impulse Propagation using WATTCH**

Therriault, James A; Pecknold, Sean; Jan 2006; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-C-266; N00014-03-C-0147

Report No.(s): AD-A473087; DRDC-A-ECR-2004-248; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473087>

DRDC Atlantic has developed a coherent transmission-loss model that simulates the propagation of acoustic pulses

through an ocean environment. Using a set of input eigenrays and an input waveform, the WATTCH (Waveform Transmission Through a Channel) model can simulate the signal received as a result of transmitting the waveform through the ocean environment. Multiple output time-series channels represent receivers at given ranges and depths. Assuming the required eigenrays can be generated, WATTCH can simulate the effects of complex range-dependant environments. This document presents the mathematical formulation and set of examples used to develop and verify the model. In addition, a comparison is made between two pulse propagation techniques. The first technique uses WATTCH to simulate the arrival of a transmitted waveform. The second technique uses WATTCH to simulate the arrival of a band-limited impulse waveform, and convolves the results with the desired transmitted waveform. The comparison shows the techniques yield equivalent results and therefore multiple waveforms may be simulated using the second technique, but only running the WATTCH model once.

DTIC

*Impulses; Mathematical Models; Underwater Acoustics*

**20080001640** Massachusetts Univ., Amherst, MA USA

### **Mobile Manipulators for Assisted Living in Residential Settings**

Deegan, Patrick; Grupen, Roderic; Hanson, Allen; Horrell, Emily; Ou, Shichao; Riseman, Edward; Sen, Shiraj; Thibodeau, Bryan; Williams, Adam; Xie, Dan; Jan 2007; 15 pp.; In English

Contract(s)/Grant(s): W911NF-05-1-0396; SES-0527648

Report No.(s): AD-A473100; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473100>

We describe a methodology for creating new technologies for assisted living in residential environments. The number of eldercare clients is expected to grow dramatically over the next decade as the baby boom generation approaches 65 years of age. The UMass/Smith ASSIST framework aims to alleviate the strain on centralized medical providers and community services as their clientele grow, reduce the delays in service, support independent living, and therefore, improve the quality of life for the up-coming elder population. We propose a closed loop methodology wherein innovative technical systems are field tested in assisted care facilities and analyzed by social scientists to create and refine residential systems for independent living. Our goal is to create technology that is embraced by clients, supports efficient delivery of support services, and facilitates social interactions with family and friends. We introduce a series of technologies that are currently under evaluation based on a distributed sensor network and a unique mobile manipulator 'MM' concept. The mobile manipulator provides client services and serves as an embodied interface for remote service providers. As a result, a wide range of cost-effective eldercare applications can be devised, several of which are introduced in this paper. We illustrate tools for social interfaces, interfaces for community service and medical providers, and the capacity for autonomous assistance in the activities of daily living. These projects and others are being considered for field testing in the next cycle of ASSIST technology development.

DTIC

*Manipulators; Populations; Remote Control; Software Development Tools*

**20080001656** Indian Inst. of Tech., Bombay, India

### **Super Resolution Imaging Applied to Scientific Images**

Chaudhuri, Subhasis; May 1, 2007; 40 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0043

Report No.(s): AD-A473125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473125>

Super-resolution refers to the process of producing a high spatial resolution image than what is afforded by the physical sensor through post processing means. It includes up sampling the image, thereby increasing the maximum spatial frequency, and removing degradations that arise during the image capture, viz., aliasing and blurring. Various methods have been explored for super resolution of material surface images as well as other images in the report. Based on observations it is recommended to use either the contourlet based method or TV based approach for super-resolving optical microscope data. To super-resolve the AFM data, it is recommended to use either TV-based approach or PG method.

DTIC

*Coding; Image Processing; Imaging Techniques; Interpolation*

**20080001677** Micro Analysis and Design, Inc., Boulder, CO USA

**A Prototype Laboratory for Developing Human Performance Representation Interchange Standards**

La Vine, Nils; Mar 2003; 65 pp.; In English

Contract(s)/Grant(s): N61339-02-C-0114; Proj-0476

Report No.(s): AD-A473157; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473157>

This report summarizes the objectives, technologies involved, technical approach, and results of an effort to provide improved behaviors to dismounted soldiers performing an operation of clearing a building in a constructive simulation. The ultimate objective was to improve upon behavioral representation within entity based simulations by employing a client-server architecture that included discrete event simulations, cognitive models, and a Computer Generated Force application for Dismounted Infantry (DI) operations in a Military Operations in Urban Terrain (MOUT) environment. The goals of this effort were focused on being able to modify the Computer Generated Force (CGF) application to utilize information provided by a behavioral server and also to improve upon the behavioral representation capabilities within the CGF application. Situational awareness information provided to a behavioral server allows for more complex behaviors than those available in the configuration managed version of the CGF application. This program was successful in all of these aspects.

DTIC

*Cognition; Human Behavior; Human Performance; Military Operations; Models; Prototypes; Situational Awareness; Terrain*

**20080001688** RAND Corp., Santa Monica, CA USA

**Using Linear Programming to Design Samples for a Complex Survey**

Bigelow, James H; Jan 2007; 58 pp.; In English

Contract(s)/Grant(s): FA7014-06-C-0001

Report No.(s): AD-A473189; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473189>

In the summer of 2005, a RAND Corporation study team was asked to assist the Air Force in assessing Air Force culture and its relationship to a range of behaviors it deemed aberrant. We developed a questionnaire for a survey of Air Force personnel on cultural attitudes (henceforth called the CULTURE survey), and designed a sample of the population to receive email invitations to participate in the survey. The design needed to meet a number of goals that may concern other survey researchers as well: (1) minimize the number of people asked to participate so as to reduce the survey burden on a population already frequently invited to take surveys; (2) reflect response rates we could anticipate from previous surveys of the population; (3) ensure adequate representation of a number of minorities of interest (rank, job type, race and ethnicity, gender, religion, and component); (4) sample enough people in each of the overlapping subset categories of interest (e.g., black female noncommissioned officers [NCOs]) to allow for statistically meaningful comparisons; and (5) minimize (to zero, if possible) the number of service members invited to take both this survey and another survey (the HEALTH survey) on an overlapping set of topics scheduled for the same time period. We describe here the method we developed for designing joint samples for the CULTURE and HEALTH surveys. The Air Force personnel inventory consists of approximately 350,000 active, 105,000 Air National Guard, 75,000 Air Force Reserve, and 150,000 civilian personnel. While our survey drew samples from all these groups, in this report we illustrate the method for the Guard and Reserve only. We wish to select a sample of these individuals that is large and diverse enough to allow us to draw conclusions about how their attitudes are related to their various personal and professional characteristics.

DTIC

*Linear Programming; Sampling; Surveys*

**20080001839** Naval Postgraduate School, Monterey, CA USA

**A Game Theory View of the Relationship Between the U.S., China and Taiwan**

Chang, Chin-Hao; Jun 2007; 65 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473254; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Taiwan Strait issue has been a major concern for those interested in the foreign policy of the USA. For quite some time, the peaceful solution to the Taiwan Strait issue has been a joint objective of the U.S., China and Taiwan. In 1962, the Cuban Missile Crisis between the Soviet Union and the U.S. almost brought about a destructive nuclear war. However, the U.S. applied a brinkmanship strategy that ended the crisis peacefully. Brinkmanship is one of the more interesting applications of game theory. I will apply game theory and analyze possible results of a brinkmanship strategy in the context of the present

Taiwan Strait situation. I will use this idea and other examples to illustrate how game theory might be applied to understand the Taiwan Strait issue.

DTIC

*China; Game Theory; International Relations; Straits; Taiwan; United States*

**20080001888** New Mexico Univ., Albuquerque, NM USA

**An Optimization Framework for Intelligence, Surveillance, and Reconnaissance Systems**

Shi, Leyuan; Apr 1, 2007; 8 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0179

Report No.(s): AD-A473334; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project is to investigate and verify the feasibility for development of a methodological approach and corresponding tools for the management of intelligence, surveillance, and reconnaissance (ISR) systems. Our focus is on problem classes for which fast heuristics may be developed for both the construction of feasible solutions and for the improvement of such solutions. However, rather than considering heuristics in isolation, we wish to obtain maximum benefit from their availability by employing them within partition-based strategies. This research is built on the very recent research in the area of computational intelligence. The newly developed methodology, the Nested Partitions (NP) framework has its ability to incorporate feasibility heuristics (in which a number of good quality feasible solutions are generated via problem-specific techniques) as well as general search heuristics such as Tabu Search (TS), Greedy Search (GS), and Genetic Algorithms (GA's).

DTIC

*Intelligence; Optimization; Reconnaissance; Surveillance*

**20080001889** Cornell Univ., Ithaca, NY USA

**Scalable Technology for a New Generation of Collaborative Applications**

Birman, Ken; Demers, Al; Gehrke, Johannes; Marzullo, Keith; Voelker, Geoff; Apr 2007; 181 pp.; In English

Report No.(s): AD-A473336; CU-41131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our MURI effort emerged from dialog between the AFRL team developing software for the Joint Battlespace Infosphere (JBT) and university researchers at Cornell and elsewhere. It became clear that to be successful, the JBT needed to break completely new ground in offering publish-subscribe capabilities on a scale never previously attempted, and do so with guarantees of security, reliability and predictable performance of a sort impossible for existing commercial products. This report details the effort, processes, and resulting technologies developed.

DTIC

*Military Operations; Topology*

**20080001915** Woods Hole Oceanographic Inst., MA USA

**Structured and Inhibited Mixing on the Continental Shelf**

Duda, Timothy F; Oct 23, 2007; 4 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0335; Proj-133335SP

Report No.(s): AD-A473366; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A goal is to understand diapycnal mixing process during the stratified summer season in the temperate continental shelf environment. This understanding is required to correctly account for the effects of mixing in coastal ocean models. These effects influence modeled (and actual) density fields, and thus flows, as well as modeled and actual distributions of dissolved and suspended material.

DTIC

*Continental Shelves; Ocean Models*

**20080001962** RAND Corp., Santa Monica, CA USA

**The Compleat Strategyst: Being a Primer on the Theory of Games of Strategy**

William, J D; Jan 1986; 287 pp.; In English

Report No.(s): AD-A473475; RAND/CB-113-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

When 'The Compleat Strategyst' was originally published in 1954, game theory was an esoteric and mysterious subject, familiar only to specialized researchers, particularly in the military. Its popularity today can be traced at least in part to this book, which popularized the subject for amateurs, professionals, and students throughout the world. It has been reprinted

numerous times and has been translated into at least five languages, including Russian and Japanese. Now, more than fifty years after its first publication as a RAND research study, and to celebrate RAND's 60th Anniversary, RAND is proud to bring this classic work back into print in paperback and digital formats.

DTIC

*Game Theory; Games*

**20080002267** NASA Langley Research Center, Hampton, VA, USA

**Research in Modeling and Simulation for Airspace Systems Innovation**

Ballin, Mark G.; Kimmel, William M.; Welch, Sharon S.; December 04, 2007; 21 pp.; In English; 6th Eurocontrol Innovative Research Workshops and Exhibition, 4-6 Dec. 2007, Bretigny, France; Original contains color illustrations

Contract(s)/Grant(s): WBS 292487.08.07.17; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002267>

This viewgraph presentation provides an overview of some of the applied research and simulation methodologies at the NASA Langley Research Center that support aerospace systems innovation. Risk assessment methodologies, complex systems design and analysis methodologies, and aerospace operations simulations are described. Potential areas for future research and collaboration using interactive and distributed simulations are also proposed.

Author

*Aerospace Systems; Simulation; Air Transportation; Mathematical Models*

**20080002406** Washington Univ., Saint Louis, MO USA

**Bandit: Technologies for Proximity Operations of Teams of Sub-10Kg Spacecraft**

Swartwout, Michael A; Oct 16, 2007; 13 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0359

Report No.(s): AD-A473589; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473589>

This work was pursued as a supplement to an existing University Nanosat-4 activity (the Akoya/Bandit mission at Washington University). The objective of this work was to develop control theory for operating the 3-kg free-flying Bandit spacecraft, as expressed by two goals: improve the fidelity and performance of our 3DOF hardware testbed and 6DOF simulator; develop, test and evaluate two methods for autonomous multi-vehicle control (behavior-based and waypoint/autopilot) Control theory was developed for teams of fixed-thrust (constrained-actuator) space vehicles, culminating in one doctoral dissertation (with two more in progress). The 6DOF simulator was greatly enhanced in both fidelity and operational effectiveness. The new 3DOF hardware testbed did not work as intended, for reasons that will be explained.

DTIC

*Control Theory; Nanosatellites*

**20080002534** Naval Academy, Annapolis, MD USA

**Swarm Manipulation of Large Surface Vessels**

Smith, Erik T; May 3, 2007; 140 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473281; USNA-TSPR-359; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this Trident project was to develop an independent control scheme to allow a team of autonomous tugboats to move a large disabled vessel, such as a barge, to a desired position and orientation. Independence refers to the extent to which each tugboat's actions were free from knowledge of the locations and actions of other tugboats. Performance of the team was quantified by measuring the positional error and time required to affect the motion, while respecting maximum power constraints on the thrust. Applications of the project include difficult or dangerous tasks such as moving disabled vessels or vessels 'not under command' through hostile or dangerous areas, and transportation of large objects such as marine construction equipment, off-shore bases, drilling platforms, and sonar arrays. Although it would be ideal to increase both the independence and performance of the system, it must be realized that by increasing one of these, the other is typically degraded. In order to measure performance, a control strategy (the baseline) was designed that required the attachment points of all tugboats to be known. However, this architecture was not desirable, since it was less independent of system knowledge. In contrast, to allow for the elimination of known tugboat location, an adaptive control strategy was developed which resulted in degradation of performance. These two Scenarios were explored and in the course of solving them, the tradeoff between performance and independence was quantified. To the author's knowledge, this is the first study of its kind and complexity. Although previous work has studied adaptive control of a multi-input and multi-output system, its extent and focus was not

close to this research. Each tugboat used on-line adaptive control methods to compensate for the unknown actions of other swarm members. The analysis was verified through simulation.

DTIC

*Automatic Control; Autonomous Navigation; Boats; On-Line Systems; Robotics*

**20080002624** Naval Postgraduate School, Monterey, CA USA

**Improving Naval Shipbuilding Project Efficiency through Rework Reduction**

Clark, Deborah L; Howell, Donna M; Wilson, Charles E; Sep 2007; 137 pp.; In English; Original contains color illustrations  
Report No.(s): AD-A473801; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The rising cost of U.S. Naval Ships and the rate of change in technology require a thorough analysis of current shipbuilding practices. The Navy wants the latest and greatest technology, while at the same time keeping overall cost low. Some technologies are obsolete before completion of the ship's design and construction. A design locked in at Critical Design Review (CDR) undergoes multiple modifications prior to ship's delivery. Design changes drive up cost. The goal is to provide the Warfighter Battlespace Dominance while keeping cost low enough to allow a consistent purchase of additional ships. To accomplish this goal, both industry and the Navy must be aware of what is driving design changes and willing to revise existing practices. The objectives of this thesis are to identify the major sources of rework and to suggest modifications and improvements to existing practices. A review of DoD Acquisition and the Shipbuilding process identifies design changes resulting from requirements volatility, inconsistent execution of Defense Acquisition, and the rigidity of the design and construction process as major sources of rework. Recommendations include improving change management, optimizing the schedule for resilience, and the use of a modular open systems approach to reduce rework.

DTIC

*Marine Technology; Ships*

**20080002640** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Checking Threat Modeling Data Flow Diagrams for Implementation Conformance and Security**

Abi-Antoun, Marwan; Wang, Daniel; Torr, Peter; Sep 2006; 21 pp.; In English

Contract(s)/Grant(s): CCF-0546550; HR0011-07-1-0019

Report No.(s): AD-A473832; CMU-ISRI-06-124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Threat modeling analyzes how an adversary might attack a system by supplying it with malicious data or interacting with it. The analysis uses a Data Flow Diagram (DFD) to describe how data moves through a system. Today, DFDs are represented informally, reviewed manually with security domain experts and may not reflect all the entry points in the implementation. We designed an approach to check the conformance of an implementation with its security architecture. We extended Reflexion Models to compare as-built DFD recovered from the implementation and the as-designed DFD, by increasing its automation and thus its adoptability. We also designed an analysis to assist DFD designers validate their initial DFDs and detect common security design flaws in them. An evaluation of the approach on subsystems from production code showed that it can find omitted or outdated information in existing DFDs.

DTIC

*Data Flow Analysis; Flow Charts; Information Flow; Models; Security*

67

**THEORETICAL MATHEMATICS**

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

**20080000618** Case Western Reserve Univ., Cleveland, OH USA

**Computational Study of Chalcopyrite Semiconductors and Their Non-Linear Optical Properties**

Lambrecht, Walter R; Sep 12, 2007; 14 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0010

Report No.(s): AD-A472459; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electronic structure studies were carried out for chalcopyrite semiconductors with the aim of modeling their optical properties. The main results of the grant are : a comprehensive study of the Intrinsic point defects In ZnGeP<sub>2</sub> (Including cation antisites, cation and anion vacancies) and CdGeAs<sub>2</sub>; a study of the feasibility of noncritical phase matching and associated nonlinear optical parameters in CdSiP<sub>2</sub> and CdSIAs<sub>2</sub>; a study of the band structure of defect chalcopyrites with formula 11-1112-V14; a study of the band gap bowing and Its effect on optical parameters In (CuAg)GaS<sub>2</sub> and AgGa(Se,Te)<sub>2</sub> alloy

systems; a study of phonons In ZnGeN<sub>2</sub> and ZnSiN<sub>2</sub>; a study of the electronic band structure In CuS<sub>2</sub>; a study of the oxygen vacancy in ZnO. The last topic was studied as a means to demonstrate the use of a new computational approach to Including band gap corrections In point defect calculations. The before last topic Is of relevance to photovoltaic applications.

DTIC

*Alloys; Energy Gaps (Solid State); Nonlinearity; Optical Properties; Pyrites; Semiconductors (Materials)*

**20080001936** Naval Postgraduate School, Monterey, CA USA

### **Oscillations of a Multi-String Pendulum**

Dendis, A; Papoulias, F A; Sep 14, 2007; 152 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473415; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The mathematical pendulum is one of the most widely studied problem in engineering physics. This is, however, primarily limited to the classical pendulum with a single bar and mass configuration. Extensions to this include multi-degree of freedom systems, but many of the classical assumptions, such as a single bar per mass, are preserved. Several designs used in practice utilize multiple or trapezoidal configurations in order to enhance stability. Such designs have not been studied in great detail and there is a need for additional work in order to fully analyze their response characteristics. The two-string pendulum design characteristics are initially investigated, both in terms of oscillation characteristics and string tension. Analytical and numerical methodologies are applied in order to predict the response of the two-string pendulum in free and forced oscillations. Validation of the results is performed by comparisons to simulations conducted with a standard commercial software package. A preliminary optimization study is conducted for a driven two-string pendulum. Finally, it is shown how to apply the results of the analysis and optimization studies developed in this work in a typical design case.

DTIC

*Differential Equations; Oscillations; Pendulums; Strings*

**20080002124** Naval Postgraduate School, Monterey, CA USA

### **Calculating Required Substructure Damping to Meet Prescribed System Damping Levels**

Penetrante, Wendel D; Jun 2007; 93 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473426; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Structural synthesis is a method of calculating the transient dynamic response of an assemblage of substructures without explicitly assembling and solving a combined system model. While significant computational advantages are provided by this method, the modal parameters of the combined system are not explicitly calculated. Hence, a method is needed to allow the a priori determination of the substructure damping levels such that the synthesized system damping is within user-prescribed bounds. This thesis focuses on the development of such a method.

DTIC

*Damping; Degrees of Freedom; Dynamic Response; Substructures*

**20080002144** Defence Science and Technology Organisation, Edinburgh, Australia

### **Wavelet Decomposition for Discrete Probability Maps**

Brown, Emily; Drake, Samuel P; Finn, Anthony; Aug 2007; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473122; DSTO-TN-0760; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473122>

Modern day electronic warfare often contains a heterogeneous mix of distributed sensors. This mix of sensors provides information about the probability of emitters being located at certain points. This discrete probability map (DPM) must be reported to the commander or some other decision maker in a timely fashion. This report shows that with respect to current methods the most effective way to transmit the DPM is through wavelet decomposition. Following an introduction into wavelet theory we go on to discuss the specifics of the Haar wavelet. Using a sample image, we show how to decompose data by wavelets, specify a compression ratio, transmit a specific region of interest only and reconstruct the data from the wavelets. Having established these techniques we give a specific example of a DPM generated by noisy sensors trying to locate a radar from time difference of arrival, bearings and scan-rate measurements. We conclude the report with a discussion of wavelet basis functions other than the Haar wavelets.

DTIC

*Decomposition; Electronic Warfare; Probability Theory; Target Acquisition; Wavelet Analysis*



**20080002408** California Univ., Los Angeles, CA USA

**Analytical and Experimental Studies of the Quantification and Propagation of Uncertainties in Nonlinear System Modeling and Simulation**

Masri, Sami F; Mar 22, 2007; 11 pp.; In English

Report No.(s): AD-A473592; FA9550-04-1-0147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473592>

The research objectives of this project were focused on developing methods and procedures suitable for use with dynamic response measurements from flexible structural components and assemblages that may incorporate elements undergoing significant multi-dimensional nonlinear deformations. By using a powerful model-free approach to obtain computationally efficient reduced-order models, a general framework was developed for the probabilistic representation and propagation of measured uncertainties in the stochastic nonlinear test articles, their related nonparametric nonlinear model, and the corresponding probabilistic time-history response of the physical system.

DTIC

*Chaos; Nonlinear Systems; Simulation*

**20080002538** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Atomic Spectral Methods for Molecular Electronic Structure Calculations: Atomic-Pair Representations of Aggregate Hamiltonian Matrices (Postprint)**

Langhoff, P W>; Hinde, R J; Mills, J D; Boatz, J A; Nov 15, 2004; 21 pp.; In English

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A473678; No Copyright; Avail.: Defense Technical Information Center (DTIC)

New methods which avoid the repeated constructions of aggregate Hamiltonian matrices over antisymmetric basis states generally required in conventional calculations of adiabatic potential energy surfaces are reported for ab initio studies of the structures, spectra, and chemical reactions of molecules and other forms of matter. A representational basis in the form of an outer spectral product of atomic eigenstates, employed in the absence of overall electron antisymmetry, is shown to facilitate development of an exact atomic-pair expression for aggregate Hamiltonian matrices. Unphysical (no-Pauli) eigenstates spanned by the atomic product basis are identified and eliminated by a unitary transformation of the Hamiltonian matrix obtained from the matrix representative of the aggregate electron antisymmetrizer. Hermitian atomic and atomic-pair interaction matrices are defined which individually have appropriate asymptotic separation limits and can be constructed once and for all employing unitary transformations of antisymmetric adiabatic diatomic eigenstates and associated potential energy curves. The aggregate Hamiltonian matrix constructed in this way includes the effects of overall electron antisymmetry and incorporates Wigner rotation matrices for representation of all angular dependencies. A particular implementation of the theory which explicitly enforces the limit of closure in spectral-product calculations is seen to correspond to adoption of canonically orthogonalized linearly-independent antisymmetrized diatomic states obtained from conventional computational procedures.

DTIC

*Aggregates; Atoms; Eigenvectors; Electronic Structure; Hamiltonian Functions; Molecular Structure; Schroedinger Equation; Spectral Methods*

**20080002542** San Diego Supercomputer Center, San Diego, CA USA

**Spectral-Product Methods for Electronic Structure Calculations (Postprint)**

Langhoff, P W; Hinde, R J; Mills, J D; Boatz, J A; Jun 12, 2007; 16 pp.; In English

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A473684; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Progress is reported in development, implementation, and application of a spectral method for ab initio studies of the electronic structure of matter. In this approach, antisymmetry restrictions are enforced subsequent to construction of the many-electron Hamiltonian matrix for an atom or molecule in an orthonormal spectral-product basis. The spectral-product approach to molecular electronic structure avoids the repeated evaluations of the one- and two-electron integrals required in construction of polyatomic Hamiltonian matrices in the antisymmetric basis states commonly employed in conventional calculations of adiabatic potential energy surfaces, providing an alternative ab initio formalism potentially suitable for computational applications more generally.

DTIC

*Electron States; Electronic Structure; Polyatomic Molecules; Spectral Methods*

**20080002593** Rice Univ., Houston, TX USA

**Multiscale Analysis, Modeling, and Processing of Higher-Dimensional Geometric Data**

Baraniuk, Richard; Aug 31, 2007; 15 pp.; In English

Contract(s)/Grant(s): FA9650-04-1-0148

Report No.(s): AD-A473755; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The wavelet transform has emerged over the last decade as a powerful new tool for statistical signal processing. The wavelet domain provides a natural setting for many applications involving real-world signals and images, especially those rich in singularities (edges, ridges, and other transients). In this project, we extended wavelet transform modeling and processing algorithms to handle multidimensional signals that are smooth save for singularities along lower-dimensional manifolds. The key building block is a new quaternion wavelet transform (QWT) that generalizes the complex wavelet transform to higher dimensions using a multidimensional Hilbert transform. The QWT has a quaternion magnitude-phase representation that encodes image shifts in an absolute (x,y)-coordinate system and thus provides a theoretical framework for analyzing the phase behavior of 2-D image shifts. We conducted a thorough analysis of the QWT phase around edge regions and thereby developed efficient multiscale edge localization and flow/motion estimation algorithms for image registration based on the QWT phase.

DTIC

*Construction; Wavelet Analysis*

**20080002657** California Univ., Santa Barbara, CA USA

**Estimation from Relative Measurements: Electrical Analogy and Large Graphs**

Barooah, Prabir; Hespanha, Joao P; Sep 12, 2007; 16 pp.; In English

Contract(s)/Grant(s): DAAD19-03-D-0004

Report No.(s): AD-A473862; CCDC-07-0912; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We examine the problem of estimating vector-valued variables from noisy measurements of the difference between certain pairs of them. This problem, which is naturally posed in terms of a measurement graph, arises in applications such as sensor network localization, time synchronization, and motion consensus. We obtain a characterization on the minimum possible covariance of the estimation error when an arbitrarily large number of measurements are available. This covariance is shown to be equal to a matrix-valued effective resistance in an infinite electrical network. Covariance in large finite graphs converges to this effective resistance as the size of the graphs increases. This convergence result provides the formal justification for regarding large finite graphs as infinite graphs, which can be exploited to determine scaling laws for the estimation error in large finite graphs. Furthermore, these results indicate that in large networks, estimation algorithms that use small subsets of all the available measurements can still obtain accurate estimates.

DTIC

*Analogies; Covariance; Electric Networks*

**20080002779** Geophysical Observatory, Helsinki, Finland

**Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2**

Olli, Martio, Editor; Drasin, David, Editor; Gehring, Frederick, Editor; Iwaniec, Tadeusz, Editor; Matti, Jutila, Editor; Keen, Linda, Editor; Kulkarni, Ravi S.; Laine, Ilpo, Editor; Lehto, Olli, Editor; Lindenstrauss, J., Editor; 2007; ISSN 1239-629X; 320 pp.; In English; See also 20080002780 - 20080002799; Original contains black and white illustrations; Copyright;

Avail.: Other Sources

Contents include: Martin boundary points of cones generated by spherical John regions; quasiconformal and quasiregular harmonic analogues of Koebe's theorem and applications; undecidable propositions by ODE'S; a remark on quasiconformal dimension distortion on the line; on nonlanding dynamic rays of exponential maps; hyperbolic distance, lambda-Apollonian metric and John disks; on the negative convergence of Thurston's stretch lines towards the boundary of Teichmueller space; on planar self-similar sets with a dense set of rotations; global estimates for the Schroedinger maximal operator; Ahlfors-regular curves in metric spaces; a note on the maximal Gurov-Reshetnyak condition; multiplicative bijections between algebras of differentiable functions; quasimoebius maps preserve uniform domains; the calculus of conformal metrics; on a function-theoretic ruin problem; sets of finite  $H(\exp 1)$  measure that intersect positively many lines in infinitely many points; primary solutions of general Beltrami equations; quasihyperbolic geometry of domains in Hilbert spaces; on bi-Lipschitz type inequalities for quasiconformal harmonic mappings; and growth estimates through scaling for quasilinear partial differential equations.

CASI

*Algebra; Calculus; Theorems; Differential Equations*

**20080002780** Ecole Polytechnique Federale de Lausanne, Switzerland

**Undecidable Propositions by ODE'S**

Buser, Peter; Scarpellini, Bruno; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 317-340; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

Starting with elementary functions, we generate new functions by multiplication, integration and by solving ODE's so as to obtain a family  $M$  of real holomorphic functions such that: (\*) if  $E$  reflex subset contained in  $N$  is recursively enumerable then there is  $f$  in  $M$  such that  $n$  in  $E$  iff  $\int_{\pi}^{+\infty} f(x)e^{-nx} dx \neq 0$ . Constructive aspects and relations to hypercomputation are discussed.

Author

*Analytic Functions; Differential Equations; Recursive Functions; Predicate Calculus*

**20080002781** Helsinki Univ., Helsinki, Finland

**A Remark on Quasiconformal Dimension Distortion on the Line**

Prause, Istvan; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 341-352; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

The general dimension distortion result of Astala says that a one dimensional set goes to a set of dimension at least  $1 - k$  under a  $k$ -quasiconformal mapping. An improved version for rectifiable sets appears in recent work of Astala, Clop, Mateu, Orobitg and Uriarte-Tuero in connection with quasiregular removability problems. We give an alternative proof of their result establishing a bound of the form  $1 - ck$ , provided that either the initial or the target set lies on a straight line. The bound  $1 - k$  holds under the additional assumption that the line stays fixed.

Author

*Distortion; Proving; Targets*

**20080002782** Technische Univ., Berlin, Germany

**On a Function-Theoretic Ruin Problem**

Jensen, Gerd; Pommerenke, Christian; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 523-543; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

In the language of classical probability theory, we consider a gambler that, at every turn, pays a fee  $m$  and wins a random amount  $X$ . In business language, we consider a firm that each month has the fixed cost (such as rents and interest payments) of  $m$  and a variable net income of  $X$  greater than or equal to 0. The gambler or firm is ruined when the capital becomes negative. We give a precise formulation in Section 2 where we also address possible interpretations in insurance. We restrict ourselves to integer values and to discrete time. The capital  $S_n$  at time  $n$  is a random variable with values in  $\mathbb{Z}$  and ruin occurs at the time  $n$  when  $S_n$  becomes negative for the first time. The main purpose of the paper is to calculate the probability that  $S_n$  has a given value  $k$  provided that ruin has not, yet occurred,

Author

*Probability Theory; Random Variables; Integers; Income*

**20080002783** Belgrade Univ., Yugoslavia

**Quasiconformal and Quasiregular Harmonic Analogues of Koebe's Theorem and Applications**

Mateljevic, Miodrag; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 301-315; In English; See also [20080002779](#)

Contract(s)/Grant(s): MNTRS 144 020; Copyright; Avail.: Other Sources

We show two versions of the Koebe theorem: one for quasiregular harmonic functions and another for quasiconformal functions. We also give an elementary proof of a version of the Koebe one-quarter theorem for holomorphic functions. As an application, we show the harmonic analogue of the Koebe one-quarter theorem and that holomorphic functions (more generally, quasiregular harmonic functions) and their modulus have similar behaviour in a certain sense.

Author

*Harmonic Functions; Analogs; Theorems; Proving; Analytic Functions*

**20080002784** Polish Academy of Sciences, Warsaw, Poland

**Primary Solutions of General Beltrami Equations**

Bojarski, Bogdan; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 549-557; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

In the paper the positive answer is given to a conjecture formulated in [lo], [17] and partially answered there. The concept

of a pair of primary solutions of the general Beltrami equation in a planar domain  $\Omega \subset \mathbb{C}$  with complex-valued measurable  $u$  and  $v$  satisfying the ellipticity condition for some  $k$ , usually written as was introduced by Iwaniec et al. in [10], [17]. In this paper, for simplicity, we restrict our considerations mainly to the case (3)  $\Omega = \mathbb{C}$ ,  $u, v$  compactly supported. Thus in the terminology of the theory of quasiconformal mappings we consider  $k$ -quasiconformal mappings  $f: \Omega \rightarrow \mathbb{C}$  with conformal univalent extensions outside a compact subset of the complex plane  $\mathbb{C}$  (also understood as the Riemann sphere  $S^2 = \mathbb{P}^1$ ).

Author

*Solutions; Ellipticity; Riemann Manifold; Theorems*

**20080002785** Hunan Normal Univ., Changsha, China

**Hyperbolic Distance, Lambda-Apollonian Metric and John Disks**

Wang, X.; Huang, M.; Ponnusamy, S.; Chu, Y.; *Annals of the Finnish Academy of Sciences: Mathematics*, Volume 32, No. 2; 2007, pp. 371-380; In English; See also [20080002779](#)

Contract(s)/Grant(s): NSF 10571048; NSF 10471039; HP 05JJ10001; NCET-04-0783; Copyright; Avail.: Other Sources

In this paper, by using the hyperbolic distance and the Lambda-Apollonian metric, we establish a sufficient condition for a simply connected proper subdomain  $D \subset \mathbb{C}$  to be a John disk. We also construct two examples to show that the converse of this result does not necessarily hold. As a consequence the answer to Conjecture 6.2.12 in the Ph.D. thesis of Broch [2] is negative.

Author

*Euclidean Geometry; Boundaries; Theorems*

**20080002786** Autonoma de Madrid Univ., Madrid, Spain

**Global Estimates for the Schroedinger Maximal Operator**

Rogers, Keith M.; Villarroya, Paco; *Annals of the Finnish Academy of Sciences: Mathematics*, Volume 32, No. 2; 2007, pp. 425-435; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

The Schroedinger equation,  $\text{div}(\Delta u) = 0$ , with initial datum  $f$  contained in a Sobolev space  $H^s(\mathbb{R}^n)$ , has solution  $e^{it\Delta} f$ . We give sharp conditions under which  $\sup_{0 < t < 1} \|e^{it\Delta} f\|$  is bounded from  $H^s(\mathbb{R}^n)$  to  $L^q(\mathbb{R}^n)$  for all  $q$ , and give sharp conditions under which  $\sup_{0 < t < 1} \|e^{it\Delta} f\|$  is bounded from  $H^s(\mathbb{R}^n)$  to  $L^q(\mathbb{R}^n)$  for all  $q$  not equal to 2. In higher dimensions, we show that  $\sup_{0 < t < 1} \|e^{it\Delta} f\|$  and  $\sup_{0 < t < 1} \|e^{it\Delta} f\|$  are bounded from  $H^s(\mathbb{R}^n)$  to  $L^q(\mathbb{R}^n)$  only if  $s$  is greater than or equal to  $1/2 - 1/2(n+1)$ .

Author

*Schroedinger Equation; Sobolev Space; Estimates*

**20080002787** California Univ., Los Angeles, CA, USA

**Ahlfors-Regular Curves in Metric Spaces**

Schul, Raanan; *Annals of the Finnish Academy of Sciences: Mathematics*, Volume 32, No. 2; 2007, pp. 437-460; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We discuss 1-Ahlfors-regular connected sets in a general metric space and prove that such sets are ‘flat’ on most scales and in most locations. Our result is quantitative, and when combined with work of Hahlomaa, gives a characterization of 1-Ahlfors regular subsets of 1-Ahlfors-regular curves in metric spaces. Our result is a generalization to the metric space setting of the analyst’s (geometric) traveling salesman theorems of Jones, Okikiolu, and David and Semmes, and it can be stated in terms of average Menger curvature.

Author

*Curvature; Metric Space; Number Theory*

**20080002788** Aarhus Univ., Denmark

**On the Negative Convergence of Thurston’s Stretch Lines Towards the Boundary of Teichmuller Space**

Theret, Guillaume; *Annals of the Finnish Academy of Sciences: Mathematics*, Volume 32, No. 2; 2007, pp. 381-408; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

Stretch lines are geodesics for Thurston’s asymmetric metric on Teichmuller space  $\mathbb{H}^1$ . Each stretch line is directed by a complete geodesic lamination. An anti-stretch line directed by the complete geodesic lamination  $p$  is a stretch line directed by  $p$  traversed in the opposite direction. It is not necessarily a geodesic. In this paper, we tackle the problem of the convergence (or non-convergence) of anti-stretch lines towards a point of Thurston’s boundary of Teichmuller space. We show that an

anti-stretch line directed by a complete geodesic lamination  $p$  which is made up of a compact and uniquely ergodic measured sublamination  $y$ , with its other leaves spiraling around it, converges to the projective class of  $y$ .

Author

*Convergence; Geodesic Lines; Boundaries; Asymmetry; Ergodic Process*

**20080002789** Washington Univ., Seattle, WA, USA

**On Planar Self-Similar Sets with a Dense Set of Rotations**

Eroglu, Kemal Ilgar; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 409-424; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We prove that if  $E$  is a planar self-similar set with similarity dimension  $d$  whose defining maps generate a dense set of rotations, then the  $d$ -dimensional Hausdorff measure of the orthogonal projection of  $E$  onto any line is zero. We also prove that the radial projection of  $E$  centered at any point in the plane also has zero  $d$ -dimensional Hausdorff measure. Then we consider a special subclass of these sets and give an upper bound for the Favard length of  $E(p)$  where  $E(p)$  denotes the  $p$ -neighborhood of the set  $E$ .

Author

*Measure and Integration; Lebesgue Theorem; Rotation*

**20080002790** Liverpool Univ., UK

**On Nonlanding Dynamic Rays of Exponential Maps**

Rempe, Lasse; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 353-369; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We consider the case of an exponential map  $E(\text{sub } k): z \text{ (right arrow) } \exp(z) + k$  for which the singular value  $k$  is accessible from the set of escaping points of  $E(\text{sub } k)$ . We show that there are dynamic rays of  $E(\text{sub } k)$ , which do not land. In particular, there is no analog of Douady's 'pinched disk model' for exponential maps whose singular value belongs to the Julia set. We also prove that the boundary of a Siegel disk  $U$  for which the singular value is accessible both from the set of escaping points and from  $U$  contains uncountably many indecomposable continua.

Author

*Conformal Mapping; Exponential Functions; Mathematical Models; Dynamics; Rays*

**20080002791** University Coll., London, UK

**Sets of Finite  $H(\text{Sup } 1)$  Measure that Intersect Positively Many Lines in Infinitely Many Points**

Csornyei, Marianna; Preiss, David; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 545-548; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We construct a planar Borel set  $A$  of finite  $H(\text{sup } 1)$ -measure such that through positively many points of  $A$ , positively many lines meet  $A$  at infinitely many points. This answers a question of Mattila. Recall that a set  $A \subset \mathbb{R}^2$  is called rectifiable if  $H(\text{sup } 1)$ -almost all of  $A$  can be covered by countably many  $C(\text{sup } 1)$  curves; a set  $A$  is purely unrectifiable if it intersects every rectifiable set (or, equivalently, every  $C(\text{sup } 1)$ -curve) in a set of  $H(\text{sup } 1)$ -measure zero. In this note, unless it is otherwise specified, by 'almost every point' we always understand  $H(\text{sup } 1)$ -a.e. point, by a 'null set of lines through a given point' we mean a set of lines passing through the point whose directions form a nullset (according to the natural measure on the set of directions) and finally by a 'null set of lines of a given direction' we mean a collection of parallel lines of that direction, whose intersection with another (non-parallel) line has zero measure. It is not difficult to see that for every rectifiable set  $C$  of finite measure, almost every line through almost every point of  $C$  intersects  $C$  only in finitely many points (we will recall the proof in the next section). Mattila asked (see 10.12 in [4], or Problem 12 in [5]) whether the same statement is true for every Borel set  $A$  with  $H(\text{sup } 1)(A) < \infty$ .

Author

*Borel Sets; Proving; Theorems; Points (Mathematics)*

**20080002792** Odessa National Univ., Odessa, Ukraine

**A Note on the Maximal Gurov-Reshetnyak Condition**

Korenovskyy, A. A.; Lerner, A. K.; Stokolos, A. M.; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 461-470; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

In a recent paper we established an equivalence between the Gurov-Reshetnyak and  $A(\text{sub } \infty)$  conditions for arbitrary absolutely continuous measures. In the present paper we study a weaker condition called the maximal

Gurov-Reshetnyak condition. Although this condition is not equivalent to  $A(\text{sub infinity})$ , even for Lebesgue measure, we show that for a large class of measures satisfying Busemann-Feller type condition it will be self-improving as is the usual Gurov-Reshetnyak condition. This answers a question raised independently by Iwaniec and Kolyada.

Author

*Borel Sets; Lebesgue Theorem; Equivalence; Functions (Mathematics)*

**20080002793** Ljubljana Univ., Ljubljana, Slovenia

**Multiplicative Bijections Between Algebras of Differentiable Functions**

Mrcun, Janez; Semrl, Peter; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 471-480; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We show that any multiplicative bijection between the algebras of differentiable functions, defined on differentiable manifolds of positive dimension, is an algebra isomorphism, given by composition with a unique diffeomorphism.

Author

*Algebra; Isomorphism; Manifolds (Mathematics); Functions (Mathematics)*

**20080002794** John Paul II Catholic Univ. of Lublin, Lublin, Poland

**On Bi-Lipschitz Type Inequalities Far Quasiconformal Harmonic Mappings**

Partyka, Dariusz; Sakan, Ken-ichi; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 579-594; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

In the paper Pavlovic proved that any quasiconformal and harmonic selfmapping  $F$  of the unit disk is bi-Lipschitz with respect to the Euclidean metric. We find explicit estimations of bi-Lipschitz constants for  $F$  that are expressed by means of the maximal dilatation  $K$  of  $F$  and  $|F(\text{sup } -1)(0)|$ . Under the additional assumption  $F(0) = 0$  the estimations are asymptotically sharp as  $K \rightarrow 1$ , so  $F$  behaves almost like a rotation for sufficiently small  $K$ .

Author

*Inequalities; Conformal Mapping; Lipschitz Condition; Euclidean Geometry*

**20080002795** Jyvaskyla Univ., Finland

**Growth Estimates through Scaling for Quasilinear Partial Differential Equations**

Kilpelainen, Tero; Shahgholian, Henrik; Zhong, Xiao; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 595-599; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

In this note we use a scaling or blow up argument to obtain estimates to solutions of equations of  $p$ -Laplacian type.

Author

*Estimating; Partial Differential Equations; Harmonic Functions; Independent Variables; Nonlinearity*

**20080002796** Hokkaido Univ., Sapporo, Japan

**Martin Boundary Points of Cones Generated by Spherical John Regions**

Hirata, Kentaro; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 289-300; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We study Martin boundary points of cones generated by spherical John regions. In particular, we show that such a cone has a unique (minimal) Martin boundary point at the vertex, and also at infinity. We also study a relation between ordinary thinness and minimal thinness, and the boundary behavior of positive superharmonic functions.

Author

*Boundaries; Harmonic Functions; Kernel Functions; Euclidean Geometry; Spherical Harmonics; Cones*

**20080002797** Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA

**Quasimobius Maps Preserve Uniform Domains**

Xie, Xiangdong; Annals of the Finnish Academy of Sciences: Mathematics, Volume 32, No. 2; 2007, pp. 481-495; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

We show that if a domain  $\Omega$  in a geodesic metric space is quasimobius to a uniform domain in some metric space, then  $\Omega$  is also uniform.

Author

*Domains; Metric Space; Hyperbolic Functions; Geodesic Lines; Conformal Mapping*

**20080002798** Manitoba Univ., Winnipeg, Manitoba, Canada

### **The Calculus of Conformal Metrics**

Schippers, Eric; *Annals of the Finnish Academy of Sciences: Mathematics*, Volume 32, No. 2; 2007, pp. 497-521; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

Minda and Peschl invented a kind of derivative of maps between Riemann surfaces, which depends on the choice of conformal metric. We give explicit formulas relating the Minda- Peschl derivatives to the Levi-Civita connection, which express the difference between the two in terms of the curvature of the metric. Furthermore, we exhibit a geometric interpretation of the derivatives in terms of a decomposition of the space of symmetric complex differentials. Finally, this decomposition is used to give simple formulas for parallel transport of complex differentials which hold for conformal metrics on a Riemann surface.

Author

*Calculus; Conformal Mapping; Riemann Manifold; Vector Spaces; Topology*

**20080002799** Helsinki Univ., Helsinki, Finland

### **Quasihyperbolic Geometry of Domains in Hilbert Spaces**

Vaisala, Jussi; *Annals of the Finnish Academy of Sciences: Mathematics*, Volume 32, No. 2; 2007, pp. 559-578; In English; See also [20080002779](#); Copyright; Avail.: Other Sources

The paper deals with basic smoothness and bilipschitz properties of geodesics, balls and spheres in the quasihyperbolic metric of a domain in a Hilbert space. 1. Introduction 1.1. Let  $E$  be a real Hilbert space with  $\dim E > 2$  and let  $G \subseteq E$  be a domain. We recall that the quasihyperbolic length of a rectifiable arc  $\gamma \subset G$  or a path  $\gamma$  in  $G$  is the number where  $l_k(\gamma) = \int_\gamma \frac{dx}{d(x, E \setminus G)} = \int_\gamma \frac{dx}{d(x, \partial G)}$ . For  $a, b \in G$ , the quasihyperbolic distance  $k(a, b) = k_G(a, b)$  is defined by  $k(a, b) = \inf_\gamma l_k(\gamma)$  over all rectifiable arcs  $\gamma$  joining  $a$  and  $b$  in  $G$ . An arc  $\gamma$  from  $a$  to  $b$  is a quasihyperbolic geodesic or briefly a geodesic if  $l_k(\gamma) = k(a, b)$ . This paper deals with basic smoothness and bilipschitz properties of geodesics, balls and spheres in the quasihyperbolic metric of a domain in a Hilbert space. The quasihyperbolic metric of a domain in  $\mathbb{R}^n$  was introduced by Gehring and Palka [GP] in 1976, and it has turned out to be a useful tool, for example, in the theory of quasiconformal maps. However, several questions on the basic quasihyperbolic geometry remain open. Important results on quasihyperbolic geodesics in domains  $G \subset \mathbb{R}^n$  were obtained by Martin [Ma] in 1985. For example, he proved that the geodesics, which always exist in domains of finite-dimensional spaces by [GO], are  $C^1$  smooth. We start by giving in Section 2 a new proof for Martin's smoothness result, valid in all Hilbert spaces. We next show that there is a universal positive constant  $r_0$  such that each quasihyperbolic ball of radius  $r < r_0$  is strictly starlike and can be mapped onto a round ball by an  $M(r)$ -bilipschitz map of  $E$  onto itself. Moreover,  $M(r) \rightarrow 1$  as  $r \rightarrow 0$ . The easier case  $\dim E < \infty$  is considered in Section 3 and the general case in Section 4. Tangential properties of a quasihyperbolic sphere  $S$  are considered in Section 5. For example, if  $\dim E < \infty$ , then  $S$  has an inner normal

Author

*Hilbert Space; Domains; Geodesic Lines; Proving*

## 70

### PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics, or 92 Solar Physics*.

**20080000366** Naval Research Lab., Washington, DC USA

### **Transparency of an Acid-Aniline Flame to S-Band Radiation**

Bryant, H M; Fye, D L; Jun 23, 1950; 26 pp.; In English

Report No.(s): AD-A472152; NRL-3690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472152>

The reaction-motor flames of the 'Lark' Missile were checked in static thrust for effective transmission of S-band radiation. Statistical averages, presented in the form of percent deviation from the normal amplitude of a transmitted signal, indicate that these flames are nearly transparent to the S-band radiation. The slight effects of such variables as plane of polarization, portion of the flame penetrated, and change in carrier frequency were considered.

DTIC

*Aniline; Carrier Frequencies; Flame Propagation; Flames; Superhigh Frequencies; Ultrahigh Frequencies*

**20080000371** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Role of Gradient and Multiscale Interface Morphology in Three-Dimensional Reinforcements in Composites (Preprint)**

Roy, Ajit K; Apr 2007; 10 pp.; In English

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A472163; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472163>

The interface morphology tailoring between the constituent phases in composites (e.g., fiber-matrix, inter-lamina, inter-yarn, nano-constituents-matrix, etc.) is essential in optimizing composite properties. In the case of composite strength, the mismatch of properties between the phases causes stress concentration at the interfaces, which in turn causes the initiation of damage and failure. A way of minimizing the mismatch of properties at the interface is demonstrated to reduce the interface stress concentration and hence delay the damage initiation process together with improving composite strength. Further, controlling the interface impedance mismatch is also important in controlling scattering of thermal energy at the interface to tailor thermal conductivity of composites, especially in the thickness direction. A gradient interface material morphology is thus desirable to enhance strength as well as other properties (e.g., thermal) of composites. Incorporation of nano constituents in composites now potentially enable us to implement the gradient interface morphology at multiple scale level, from nano meter (nano constituent interface) to laminate ply interlayer (micro meter scale). In this study, the effect of implementing the gradient interface at different scale level is reviewed to assess its potential in enhancing composite strength and thermal properties.

DTIC

*Gradients; Laminates; Morphology; Three Dimensional Composites*

**20080000424** Army Research Lab., Aberdeen Proving Ground, MD USA

**Measuring In-Flight Angular Motion With a Low-Cost Magnetometer**

Harkins, Thomas E; Wilson, Michael J; Sep 2007; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472265; ARL-TR-4244; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472265>

A technique for obtaining pitch, yaw, and roll rates of a projectile from a single, low-cost, commercial off-the-shelf magnetometer has been developed at the Advanced Munitions Concepts Branch of the U.S. Army Research Laboratory's Weapons and Materials Research Directorate. In this report, the magnetometer-based methodology is presented, the flight experiment and subsequent analyses are described, criteria for use of this methodology are given, and the potential uses of this technique in inertial measurements unit/INS applications are discussed.

DTIC

*Angular Velocity; Commercial Off-the-Shelf Products; Detectors; Low Cost; Magnetometers*

**20080000427** Oak Ridge Inst. for Science and Education, TN USA

**An Analysis of Vertebral Stress and BMD During +Gz Impact Accelerations**

Gallagher, Hilary L; Buhrman, John R; Perry, Chris E; Mosher, Stephen E; Wilson, Delano D; Apr 2007; 114 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-04-D-6472; MIPR-AFRLHE9981MISC; Proj-7184

Report No.(s): AD-A472271; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472271>

The U.S. Air Force pilot population includes both males and females with an expanded range of anthropometric measurements. To address concerns that females and/or small and large individuals may be more at risk during ejections, a series of tests were conducted at the Air Force Research Laboratory (AFRL) to identify the effects of gender and size on vertebral stress and BMD. Twenty-two males and twenty-four females were tested at acceleration levels up to 10G on a vertical deceleration tower. The subjects' bone mineral density (BMD) and vertebral size at C2, C5, T12, L1, and L2 were measured by quantitative computed tomography (QCT). Vertebral loads and stresses were calculated at the five selected vertebrae for all subjects. As expected, vertebral sizes were significantly smaller for the female subjects when compared to the male subjects. No significant gender differences were found for BMD values except C2 which was 10% lower in females. Females have significantly higher vertebral stresses in the cervical vertebrae while no significant gender differences were found in the thoracic and lumbar vertebrae. Relationships between stress and weight, height, and sitting height were investigated for the five vertebrae. Correlations were found between stress and weight at T12, L1, and L2.

DTIC

*Acceleration (Physics); Bone Mineral Content; Bones; Minerals; Spine; Stress Analysis*



**20080000843** NASA Langley Research Center, Hampton, VA, USA

**Corrigendum: New Form of Kane's Equations of Motion for Constrained Systems**

Roithmayr, Carlos M.; Bajodah, Abdulrahman H.; Hodges, Dewey H.; Chen, Ye-Hwa; [2007]; 5 pp.; In English  
Contract(s)/Grant(s): WBS 992858.13.07.02; Copyright; Avail.: CASI: A01, Hardcopy

A correction to the previously published article 'New Form of Kane's Equations of Motion for Constrained Systems' is presented. Misuse of the transformation matrix between time rates of change of the generalized coordinates and generalized speeds (sometimes called motion variables) resulted in a false conclusion concerning the symmetry of the generalized inertia matrix. The generalized inertia matrix (sometimes referred to as the mass matrix) is in fact symmetric and usually positive definite when one forms nonminimal Kane's equations for holonomic or simple nonholonomic systems, systems subject to nonlinear nonholonomic constraints, and holonomic or simple nonholonomic systems subject to impulsive constraints according to Refs. 1, 2, and 3, respectively. The mass matrix is of course symmetric when one forms minimal equations for holonomic or simple nonholonomic systems using Kane's method as set forth in Ref. 4.

Derived from text

*Equations of Motion; Transformations (Mathematics); Inertia; Matrices (Mathematics); Coordinates*

**20080001056** Army Research Lab., Aberdeen Proving Ground, MD USA

**Extracting Stress-Strain and Compressive Yield Stress Information from Spherical Indentation**

Juliano, Thomas F; VanLandingham, Mark R; Weerasooriya, Tusit; Moy, Paul; Sep 2007; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): 1120-1120-99; Proj-AH84

Report No.(s): AD-A472755; ARL-TR-4229; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472755>

In recent years, instrumented indentation has become increasingly used to measure mechanical properties such as elastic modulus and fracture toughness at the micrometer scale. In this work, an experimental method is developed to estimate stress-strain behavior using indentation load-displacement and continuous stiffness measurement data. An attempt is made to subtract plastic behavior out of the loading curve to generate stress-strain data from which elastic modulus and yield stress can be determined. Indentation data generated using three indentation tips with spherical caps (20-, 50-, and 500-  $\mu$ m radii) are compared to bulk mechanical test data for a number of materials important for U.S. Army applications, including polycarbonate, polymethylmethacrylate, a tungsten carbide ceramic composite (WC with 11.6% Cobalt), rolled-homogeneous armor steel, and a titanium alloy (Ti Al6% V4%). The goal of this effort is to be able to predict a macroscopic stress-strain curve from a microscale test using spherical indentation while allowing the indenter to deviate from a perfect spherical shape.

DTIC

*Armor; Compression Loads; Indentation; Polycarbonates; Stresses; Stress-Strain Relationships; Tungsten Carbides*

**20080001217** Defence Research and Development Canada, Toronto, Ontario Canada

**Impulse Noise: Measurement Techniques and Hearing Protector Performance. Report on Scientific Exchange at the French-German Research Institute of Saint-Louis**

Nakashima, Ann; Buck, Karl; Hamery, Pascal; De Mezzo, Sebastien; Brom, Gilbert; Oct 2006; 37 pp.; In English; In English; Original contains color illustrations

Report No.(s): AD-A472973; DRDC-TM-2006-231; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Measurements of impulse noise and the performance of several hearing protection devices were done in Saint-Louis and Baldersheim, France at the French-German Research Institute of Saint-Louis (ISL) in August 2006. Hearing protector performance was evaluated using an acoustic test fixture that was designed by ISL. Impulse noises of peak levels from 110 to 190 dB were produced by detonation of explosives. The noise attenuation achieved by a Peltor communications headset (MT15H68 FB 950) and a Peltor Optime III earmuff was measured alone and in combination with a Bilsom nonlinear earplug (Model 655). The Peltor Optime III provided slightly more attenuation than the communications headset up to about 2 kHz. When used in the combination with the earplug, similar attenuation was achieved for the two devices. A prototype AEARO earplug was also tested in the blast noise, and was found to provide good attenuation at low frequencies when used in the nonlinear mode. The performance of the Nacre QuietPro active earplug system was measured in pink noise of 85, 90 and 95 dB. The device provided good attenuation in the passive mode and adequate protection in the push-to-talk (PTT) modes. It is expected that the work performed will lead to future collaborations between DRDC Toronto and ISL in the area of protection from impulse noise and blasts.

DTIC

*Ear Protectors; Impulses*

**20080001246** Wright Lab., Wright-Patterson AFB, OH USA

**Enhancing Warfighter Cognitive Abilities with Transcranial Magnetic Stimulation: A Feasibility Analysis**

Nelson, Jeremy T; Jun 2007; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A473032; AFRL-HE-WP-TR-2007-0095; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study examined the feasibility of using transcranial magnetic stimulation (TMS) to enhance warfighter cognitive abilities. An extensive literature review was conducted and several TMS laboratories were visited. Discussions were also held with several of the leading experts in the field of brain stimulation. The final recommendation of this study is to pursue TMS research with prudence, as the current state of the technology is still very oriented towards basic science exploration. Several studies have begun to show cognitive enhancement benefits of TMS in basic tasks, but work has yet to be done in more complex domains that would be of greatest benefit to the warfighter.

DTIC

*Abilities; Augmentation; Brain; Cognition; Feasibility Analysis; Magnetic Fields; Mental Performance; Stimulation*

**20080001259** Stanford Univ., Stanford, CA USA

**Quasi-Phasematched Nonlinear Optics: Materials and Devices**

Fejer, M M; Gaume, R; Huang, J; Hum, D; Kuo, P; Roussev, R; Route, R; Schober, A; Wisdom, J; Xie, X; Apr 16, 2007; 29 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0240; DAAD19-02-1-0184

Report No.(s): AD-A473051; SPO-27172; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This program focused on the development of micro-structured nonlinear optical materials and quasi-phasematched devices based on those materials. The two material systems investigated, periodically-poled ferroelectrics, especially lithium niobate (PPLN), and orientation-patterned GaAs (OP-GaAs), enable nonlinear interactions impossible in conventional nonlinear media. The work included characterization of vapor-transport-equilibrated materials, enhancements in periodic-poling technology, and development of tight bends in proton-exchanged waveguides. After the materials characterization and improvements in process development, we fabricated new devices including OP-GaAs devices for broadband optical parametric generation (OPG) at mid-infrared wavelengths, bulk PPLN devices for soliton amplifiers, and PPLN reverse-proton-exchanged waveguide devices for quasi-group-velocity-matching, telecommunication applications and generation of nearly-transform-limited OPG. Supplemental MIPR funding from DARPA was used to support and purchase ceramic fabrication equipment for the fabrication of transparent laser host materials, supported primarily under ARO Grant DAADI9-02-1-0184.

DTIC

*Nonlinear Optics; Nonlinearity; Optical Materials*

**20080001443** Naval Research Lab., Washington, DC USA

**Electromagnetic Probes for Supersonic Flames**

Gager, F M; Schleter, G C; Jun 30, 1949; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472247; NRL-3505; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472247>

This report details the development of electromagnetic probes for S, X, and K-band insertion loss studies on supersonic flames and of associated automatic VSWR equipment. Evaluation of the life of the probes is set forth, along with information on flame-loading of probes and certain insertion loss data taken with a 1500-lb oxygen-alcohol and a 400-lb acid-aniline motor.

DTIC

*Flames; Electromagnetic Properties; Supersonics*

**20080001552** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**BASE 04 Transmission Loss Measurement and Modelling**

Calnan, C; Oct 2006; 54 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707-05-3094

Report No.(s): AD-A472975; DRDC-CR-2006-108; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A previous contract resulted in the addition of the ray theory program Bellhop to the reverberation inversion program

BREVER. This was done to allow inversion of reverberation results calculated from acoustic data recorded during the BASE 04 trials. However tests with Bellhop using parameters from the BASE 04 site indicated shortcomings in that program. The current contract began with test runs of CASS, a potential Bellhop replacement for reverberation inversions. The test results indicated that CASS would work properly for the analysis area. Accordingly, BREVER was enhanced to allow it to also use CASS, and reverberation inversion was performed. The inversion results were used to model transmission loss, and these modelled values were compared to transmission loss data calculated from measured data. Because of this contract the BREVER User's Guide was expanded to describe the use of the CASS-enabled version of the program.

DTIC

*Transmission Loss; Acoustic Properties; Replacing*

**20080001632** Indian Inst. of Tech., Kanpur, India

**Imaging the Spatial Distribution of Transport Currents and the Phenomenon of Nanoscale Phase Separation Phenomenon in CMR Materials**

Banerjee, Satyajit; Sep 13, 2007; 5 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0073

Report No.(s): AD-A473092; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473092>

The aim of the proposal was to develop a magneto-optics imaging 'MOI' set up which will enable the direct imaging of transport current distribution inside a variety of materials. The primary objective of the proposal was to enhance the sensitivity of the existing magneto-optical imaging setup developed in the PI's laboratory to optically image the self fields generated by transport currents sent through materials. Based on the above objective it was planned to apply this technique to investigate fundamental issues like magnetic phase separation in colossal magneto resistive materials as well as to investigate possible applications like nondestructive detection of stress and fatigue in materials. As of now, success has been achieved in enhancing the sensitivity of our MOI setup so as to enable the imaging of transport currents down to 20 mAmps. Furthermore, characterization of the magnetic ground state in a particular CMR material has been performed, which subsequently will be investigated with the MOI setup.

DTIC

*Imaging Techniques; Magneto-Optics; Magnetoresistivity; Spatial Distribution*

**20080001639** National Taiwan Univ., Taipei, Taiwan, Province of China

**Applications of Nanotechnology in Biomimetics and Biocatalysts**

Mou, Chung-Yuan; May 1, 2007; 3 pp.; In English

Contract(s)/Grant(s): FA5209-05-P-0502

Report No.(s): AD-A473099; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473099>

The objectives of the proposed research are to synthesize model compounds to mimic enzymes and to evaluate enzymatic activities and the stabilities of metal reactive centers and biocatalysts encapsulated in the nanochannels of MCM-41 and other mesoporous materials. The following spectroscopic techniques to characterize the materials and to elucidate the reaction mechanism: XRD, FT-IR, UV-visible, EPR and EXAFS have been applied. Efforts in the first six months of this study were concentrated to elucidate the mechanistic pathways in the degradation 'oxidation' of polycyclic aromatic hydrocarbons of polycyclic aromatic hydrocarbons by cytochrome c enzymes immobilized in mesoporous materials. Studies of other parts of the proposed research were to follow.

DTIC

*Biomimetics; Catalysts; Enzymes; Nanotechnology*

**20080001696** Army Tank-Automotive Command, Warren, MI USA

**Non Destructive Testing of Body Armor Plates for Structural Integrity**

Schehr, Steven; Meitzler, Thomas; Smith, Greg; Apr 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473207; TARDEC-17077; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473207>

This briefing describes a method of testing the structural integrity of ceramic armor plate using vibration modes and piezoelectric sensors.

DTIC

*Armor; Destructive Tests; Piezoelectric Transducers; Structural Failure; Vibration*

**20080001851** Air Force Research Lab., Wright-Patterson AFB, OH USA

**The Effects of Space Charge in a Hypersonic Magnetohydrodynamic Power Generator**

Thibodeaux, Rene J; Jun 2007; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-3145

Report No.(s): AD-A473277; AFRL-PR-WP-TP-2007-232; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper explores a new MHD generator design that uses space charge to create an axial-symmetric electric field in the region between concentric cylindrical channels. The space charge fraction is shown to have a significant effect in the current density, power density, electric field, output voltage, efficiency, pressure drop, and enthalpy. The radial symmetry produces simple analytic solutions for these equations over a wide range of gas flow speeds. Adjustments in the space charge can be used to regulate the output voltage of the generator for a constant magnetic field. This technique can eliminate the need for a full output power conditioner.

DTIC

*Hypersonics; Magnetohydrodynamic Generators; Space Charge*

**20080001883** Naval Academy, Annapolis, MD USA

**Remote Measurement of High Temperatures in the Presence of a Strong Magnetic Field**

Lord, Scott F; May 7, 2007; 50 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473328; USNA-TSPR-355; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The environment inside a railgun makes conventional temperature sensing techniques ineffective. Large time-varying magnetic fields induce noise into sensors with electrical connections. The high rate of change of temperature requires a fast thermal response and a fast sampling rate. Finally, the intense heat generated requires a sensor that is thermally stable over a large range of temperatures. To overcome such environmental challenges, this project utilized an interferometric technique where the temperature is measured remotely with a low power laser and a thin sapphire sensor. A sapphire sensor with a semi-reflective coating on one side and a near totally reflective coating on the other side was designed, constructed, and evaluated. To design the sensor for maximum sensitivity a computational model was developed to determine optimal coating thicknesses. To construct the sensor, nickel and nickel oxide coatings were deposited onto a sapphire dye with the use of electron-beam metal vapor deposition. A laser was directed at the sensor at normal incidence, and the reflection from the sensor was collected with a photodiode. As the sensor's temperature was manipulated between 26 C and 355 C its reflectance changed due to variations in the optical properties of the sapphire, nickel oxide, and nickel. The data indicated the sensor responded in a manner similar to the theoretical model. Based on that data, an algorithm was developed to convert the collected optical signal into temperature data, creating a functional temperature sensing system. The system was then taken to the Naval Research Laboratory in Washington D.C. where it was used to monitor the temperature of a hollowed stainless steel cylinder through which high density current pulses were forced. The optical system's performance under such conditions was compared against a type K thermocouple, and the system demonstrated superior time response and relative immunity to electromagnetically induced noise.

DTIC

*High Temperature; Magnetic Fields; Remote Control; Remote Sensing; Temperature Measurement*

**20080002548** Naval Postgraduate School, Monterey, CA USA

**Wavelet-Based Signal Processing of Electromagnetic Pulse Generated Waveforms**

Ardolino, Richard S; Sep 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis investigated and compared alternative signal processing techniques that used wavelet-based methods instead of traditional frequency domain methods for processing measured electromagnetic pulse (EMP) waveforms. The primary focus of the research was equalization and filtering techniques for processing EMP signals in additive white noise. Signal equalization was conducted at the sub-band level through the use of Infinite Impulse Response (IIR) filters and channel response characteristics. A brief investigation of signal de-noising through wavelet thresholding was also conducted. This thesis also addressed and provided viable methods for signal extraction and DC bias removal for a given measured EMP waveform. The mean squared error is used as the basis for the comparison of the effectiveness of the equalization algorithm. It was found that wavelet techniques provided results that were as well or better than traditional Fourier techniques. In systems with additive noise, wavelet-based techniques exceeded the performance of the Fourier-based methods and surpassed them when de-noising techniques were used.

DTIC

*Electromagnetic Pulses; Signal Processing; Waveforms; Wavelet Analysis*

**20080002665** Army Research Lab., Adelphi, MD USA

**Radio Frequency (RF) Measurements for Human Detection, Tracking, and Identification**

Pizzillo, Thomas J; Oct 2007; 42 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473888; ARL-TR-4302; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes a protocol that is to be used during radio frequency measurements of humans. The purpose of the experiment is to measure the unique radar signature of walking humans so that methods of detecting and classifying dismounts can be developed. This information is needed for emerging UAV-based radar systems that must operate in complex urban environments. This report provides details of the experimental procedure, locations, safety considerations, and instrumentation. Also included is the volunteer agreement affidavit and the volunteer solicitation advertisement.

DTIC

*Detection; Radio Frequencies; Tracking (Position)*

**20080002673** Army Research Lab., Adelphi, MD USA

**Ku-Band Radio Frequency Microelectromechanical System Enabled Electronically Scanned Antenna**

Polcawich, Ronald G; Judy, Daniel; Pulskamp, Jeffrey S; Weiss, Steve; Oct 2007; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473896; ARL-TR-4280; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Army Research Laboratory (ARL) has designed, fabricated, and measured an eight element Ku-band radio frequency (RF) microelectromechanical system (MEMS) based electronically scanned antenna (ESA). This ESA is comprised of eight patch antennas with each patch individually fed by separate phase shifters. The reflection phase shifters use ARL's patent pending MEMS ohmic shunt switch. The ohmic shunt switch performance characteristics include insertion loss less than 0.3 decibel (dB) and isolation greater than 20 dB from direct current (DC) to 40 gigahertz (GHz). The 17 GHz phase shifters have an average insertion loss of 2.5 dB and a return loss greater than 20 dB. The effort resulted in successful beam steering using RF MEMS phase shifters. The work represents ARL's continuing effort in low-cost electronically scanned antennas in support of the Future Force.

DTIC

*Microelectromechanical Systems; Radio Frequencies; Superhigh Frequencies*

**20080002884** Naval Postgraduate School, Monterey, CA USA

**Radio Frequency Identification's Potential to Monitor Small Vessels**

Crofts, John A; Sep 2007; 79 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473874; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study examines the possibility of applying Radio Frequency Identification (RFID) technology to monitoring small vessels. The study focuses on the technology's applicability to maritime security, resource management, and the public. The costs and benefits of using RFID on waterways are analyzed, with special attention given to privacy and public acceptance. The thesis then discusses a completed proof of concept study and concludes with preliminary guidelines for creating an RFID-driven small vessel monitoring program.

DTIC

*Radio Frequencies; Ships*

**20080012257** California Inst. of Tech., Pasadena, CA USA

**Automated mass spectrometer analysis system**

Boettger, Heinz G., Inventor; Giffin, Charles E., Inventor; Dreyer, William J., Inventor; Kuppermann, Aron, Inventor; April 11, 1978; 13 pp.; In English

Patent Info.: Filed June 16, 1975; US-PATENT-4,084,090; US-PATENT-APPL-SN-587097; No Copyright; Avail.: CASI:

A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012257>

An automated mass spectrometer analysis system is disclosed, in which samples are automatically processed in a sample processor and converted into volatilizable samples, or their characteristic volatilizable derivatives. Each volatilizable sample is sequentially volatilized and analyzed in a double focusing mass spectrometer, whose output is in the form of separate ion beams all of which are simultaneously focused in a focal plane. Each ion beam is indicative of a different sample component or different fragments of one or more sample components and the beam intensity is related to the relative abundance of the sample component. The system includes an electro-optical ion detector which automatically and simultaneously converts the

ion beams, first into electron beams which in turn produce a related image which is transferred to the target of a vidicon unit. The latter converts the images into electrical signals which are supplied to a data processor, whose output is a list of the components of the analyzed sample and their abundances. The system is under the control of a master control unit, which in addition to monitoring and controlling various power sources, controls the automatic operation of the system under expected and some unexpected conditions and further protects various critical parts of the system from damage due to particularly abnormal conditions.

Official Gazette of the U.S. Patent and Trademark Office

*Mass Spectrometers; Electro-Optics; Ion Beams; Electron Beams*

## 71 ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

**20080000426** Army Research Lab., Adelphi, MD USA

### **A Novel Approach for Making Dynamic Range Measurements in Radio Frequency Front Ends for Software Controlled Radio Architectures**

Mitchell, Gregory; Fazi, Christian; Sep 2007; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472268; ARL-TR-4235; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472268>

A novel setup to perform two-tone spurious-free dynamic range (SFDR) measurements on a mixer using a single analog input port is introduced. When access to the intermediate frequency (IF) port in a radio frequency (RF) front-end circuit is not available, the traditional two-port method for making an SFDR measurement is inadequate. Passing the analog input through a directional coupler between the RF combiner and the mixer facilitates the performance of the traditional third order intermodulation (IMD) test. Key differences between the single-port and traditional two-port setups are explained, and experimental data obtained using the single-port setup is compared to data obtained using the traditional two-port setup for two different mixer models. This data confirms that while the single-port approach yields similar results, a calibration to account for the additional losses introduced by the directional coupler is needed.

DTIC

*Dynamic Range; Radio Frequencies; Ranging*

**20080000592** Oregon State Univ., Newport, OR USA

### **Datasets of Odontocete Sounds Annotated for Developing Automatic Detection Methods**

Mellinger, David K; Sep 2007; 27 pp.; In English

Contract(s)/Grant(s): N00244-06-P-1870

Report No.(s): AD-A472370; NPS-OC-07-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Environmental laws and public concern require that the U.S. Navy conduct operations and training such that impacts to marine mammals are minimized and any adverse impacts mitigated. To that end, it is important for the Navy to monitor the occurrence and behavior of marine mammals during research and operational activities. One method for this is passive acoustic monitoring, which has primarily been used for baleen whale vocalizations. However, baleen whales are only a small fraction of marine mammals, whereas the greatest public concern and possible impact to Navy operations now centers on odontocetes, particularly beaked whales. Accordingly, passive acoustic monitoring techniques need to be extended to odontocetes. This report documents the compilation of an archive of existing beaked whale recordings, and summarizes the deliberations/discussions at a meeting in Boston (Sept. 2006) to determine (or, at least, reach consensus of) how the content, structure, and format of that archive should look. The archive, which will then be usable for studying automatic recognition of marine mammal (particularly odontocete) sounds (i.e., passive acoustic monitoring), is presently available to researchers and engineers through the MobySound database at Oregon State University.

DTIC

*Animals; Annotations; Detection; Mammals; Marine Biology; Underwater Acoustics; Whales*

**2008000595** Duke Univ., Beaufort, NC USA

**Continued Development of the SEAMAP Data Archive**

Best, Ben; Halpin, Patrick; Read, Andrew; Sep 2007; 21 pp.; In English

Contract(s)/Grant(s): N00244-06-P-1725

Report No.(s): AD-A472374; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Environmental laws and public concern require that the U.S. Navy conduct operations and training such that impacts to marine mammals are minimized and any adverse impacts mitigated. To that end, an archive of marine mammal distribution and movements is needed. The digital geo-referenced data archive known as Spatial Ecological Analysis of Megavertebrate Animal Populations (SEAMAP) is the world's largest public archive of marine mammal, seabird, and sea turtle observations. This report documents the incorporation of 31 new datasets from inside and outside the U.S. EEZ to SEAMAP over the period June-June 2006/7. Additionally, this report describes the adaptation of new data types (e.g., marine mammal photographic identification) to the SEAMAP archive, and describes plans to adapt acoustic data (e.g. ARP, HARP) to the archive. Finally, enhancements over the period June-June 2006/7 to the interfaces for users of and data providers to SEAMAP are described.

DTIC

*Acoustic Properties; Animals; Documents; Marine Biology; Populations*

**2008000857** NASA Langley Research Center, Hampton, VA, USA

**Modeling of SAW Delay Lines**

Wilson, William C.; Atkinson, Gary M.; [2007]; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 645846.02.07.07; Copyright; Avail.: CASI: [A01](#), Hardcopy

Integrated Vehicle Health Monitoring (IVHM) of aerospace vehicles requires rugged sensors having reduced volume, mass, and power that can be used to measure a variety of phenomena. Wireless systems are preferred when retro-fitting sensors onto existing vehicles. Surface Acoustic Wave (SAW) devices are capable of sensing: temperature, pressure, strain, chemical species, mass loading, acceleration, and shear stress. SAW technology is low cost, rugged, lightweight, and extremely low power. To aid in the development of SAW sensors for IVHM applications, a first order model of a SAW Delay line has been created.

Derived from text

*Surface Acoustic Wave Devices; Mathematical Models; Acoustic Delay Lines; Systems Health Monitoring; Optimization*

**2008000947** National Taiwan Univ. of Science and Technology, Taipei, Taiwan, Province of China

**On Analysis of Passive Underwater Acoustic Damping Materials**

Wang, Chao-Nan; Tse, Chuan-Cheung; Chen, Shih-kai; Journal of the Chinese Institute of Engineers, Volume 30, No.2; March 2007, pp. 251-257; In English; See also [2008000927](#)

Contract(s)/Grant(s): NSC-92-2611-E-002-011; Copyright; Avail.: Other Sources

A theoretical approach has been developed to evaluate the noise reduction characteristics of underwater acoustic damping materials. In this study, materials proposed in the literature are considered and analyzed. The analysis model is based on the elastic theory and the transfer function method. The numerical result of a filled rubber inaterials system is verified using an experimental measurement from the literature for high frequency range (approximately 7 MHz). However, material suitable for a lower frequency range (approximately 20 kHz) is desired in this study. So acoustic reflective properties of materials consisting of different components are analyzed and discussed.

Author

*Absorbers (Materials); Acoustic Attenuation; Acoustic Properties; Underwater Acoustics*

**2008001008** Library of Congress, Washington, DC USA

**Active Military Sonar and Marine Mammals: Events and References**

Buck, Eugene H; Calvert, Kori; Nov 22, 2005; 18 pp.; In English

Report No.(s): AD-A472646; CRS-RL33133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472646>

The deployment of active sonar by the U.S. Navy and its potential impacts on marine mammals has been an ongoing issue of intense debate, regulatory, legislative, and judicial activity; and international concern. Some peacenme use of military sonar has been regulated under the Marine Mammal Protection Act (MMPA) and other statutes due to concerns that active military sonars are operated at frequencies used by some cetaceans (i.e., whales, porpoises, and dolphins), and their high- intensity sound pulses may travel long distances in the ocean. There is also concern that sonar transmissions of sufficiently high

intensity might physically damage the hearing in cetaceans or cause them to modify their behavior in ways that are detrimental. Although mid-frequency sonar has been implicated in several beaked whale strandings, there is scientific uncertainty surrounding the totality of the effects active sonar transmissions may have on marine mammals.

DTIC

*Mammals; Sonar*

**20080001012** Library of Congress, Washington, DC USA

**Active Military Sonar and Marine Mammals: Events and References**

Buck, Eugene H; Calvert, Kori; Nov 3, 2005; 18 pp.; In English

Report No.(s): AD-A472654; CRS-RL33133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472654>

The deployment of active sonar by the U.S. Navy and its potential impacts on marine mammals has been an ongoing issue of intense debate; regulatory, legislative, and judicial activity; and international concern. Some peacetime use of military sonar has been regulated under the Marine Mammal Protection Act (MMPA) and other statutes due to concerns that active military sonars are operated at frequencies used by some cetaceans (i.e., whales, porpoises, and dolphins), and their high-intensity sound pulses may travel long distances in the ocean. There also is concern that sonar transmissions of sufficiently high intensity might physically damage the hearing in cetaceans or cause them to modify their behavior in ways that are detrimental. Although mid-frequency sonar has been implicated in several beaked whale strandings, there is scientific uncertainty surrounding the totality of the effects active sonar transmissions may have on marine mammals. This report summarizes legal and political events related to active sonar and marine mammals since 1994. Prior to the late 1990s, concerns focused primarily on the use of underwater sound as a research tool. While strandings and mortality of marine mammals have been observed in concurrence with mid-frequency sonar operation, additional controversy has focused on the development of low-frequency active (LFA) sonar. Environmental interests are concerned with LFA sonar because low-frequency sound travels farther than mid-frequency sound and is closer in frequency to those known to be used by baleen whales. Additional questions involve how to balance obligations of the military to comply with MMPA provisions (as well as provisions of the National Environmental Policy Act and the Endangered Species Act) with national security concerns. This report summarizes some of the more significant recent events pertaining to the environmental effects of active military sonar.

DTIC

*Animals; Chronology; Environmental Surveys; Intermediate Frequencies; Law (Jurisprudence); Legal Liability; Low Frequencies; Marine Biology; Navy; Sonar*

**20080001145** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Measurements and Analysis of Reverberation and Clutter Data**

Ellis, Dale D; Apr 2007; 34 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-1-0420

Report No.(s): AD-A472781; DRDC-ATLANTIC-ECR2007-065; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the objectives and some of the results from a three-year joint collaboration between DRDC Atlantic and the Applied Research Laboratory of The Pennsylvania State University to analyze and model reverberation data. Reverberation data up to 4 kHz had been collected on towed arrays during the initial (1996 2002) NATO MILOC Rapid Environmental Assessment exercises and more recent JRPs (Joint Research Projects) between the US, Canada, and SACLANTCEN (now NURC, NATO Undersea Research Centre). Preliminary analysis and modeling of the data had been conducted, and reported at various conferences. For this project the data were analyzed and modeled in more detail, and the results reported in formal journal publications. Experiments were designed and conducted as part of a multi-ship trial in the Mediterranean in 2004, using arrays with directional sensors to perform left-right discrimination. A fast forward reverberation model was developed, suitable for inversion of environmental parameters in shallow water. Towed array beam patterns were incorporated, including the effects of directional sensors; results are presented showing the effects of cardioid and limac on sensors. The model has also been extended to model echoes from targets and scattering features; preliminary comparisons with data from 2004 have been made. Future work includes a follow on JRP and clutter experiment in 2007, and extensions to the model for quantitative analysis of clutter scattering strengths.

DTIC

*Clutter; Echoes; Reverberation; Targets*



**20080001155** Woods Hole Oceanographic Inst., MA USA

**Statistical Characterization of Fish School Clutter**

Stanton, Timothy K; Chu, Dezhang; Oct 2007; 6 pp.; In English

Contract(s)/Grant(s): N00014-06-1-0197

Report No.(s): AD-A472811; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To significantly reduce the probability of false alarm in Navy active sonar systems. This goal will be achieved through developing signal algorithms for active sonar systems which can account for the non-Rayleigh nature of clutter from fish schools. Part of this goal will involve characterizing the performance of the algorithm.

DTIC

*Algorithms; Clutter; Echoes; Fishes; Schools; Sonar*

**20080001248** Woods Hole Oceanographic Inst., MA USA

**Measuring the Spatial Distribution of Ripples Using REMUS AUV**

Geyer, Wayne R; Oct 10, 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0625; Proj-130625SP

Report No.(s): AD-A473036; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long term goal of this work is to increase our understanding of bedform geometry and processes associated with bedforms on the continental shelf. To do this we have been developing novel measurement techniques, conducting observations of both the spatial and temporal variability of ripples and developing a variety of model approaches.

DTIC

*Continental Shelves; Measurement; Models; Ripples; Spatial Distribution*

**20080001448** NASA Glenn Research Center, Cleveland, OH, USA

**Noise Reduction Technologies for Turbofan Engines**

Huff, Dennis L.; September 2007; 17 pp.; In English; 35th International Congress and Exposition on Noise Control Engineering (INTER-NOISE 2006), 3-6 Dec. 2006, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.01

Report No.(s): NASA/TM-2007-214495; E-15787; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080001448>

Significant progress continues to be made with noise reduction for turbofan engines. NASA has conducted and sponsored research aimed at reducing noise from commercial aircraft. Since it takes many years for technologies to be developed and implemented, it is important to have aggressive technology goals that lead the target entry into service dates. Engine noise is one of the major contributors to the overall sound levels as aircraft operate near airports. Turbofan engines are commonly used on commercial transports due to their advantage for higher performance and lower noise. The noise reduction comes from combinations of changes to the engine cycle parameters and low noise design features. In this paper, an overview of major accomplishments from recent NASA research programs for engine noise will be given.

Author

*Noise Reduction; Engine Noise; Turbofan Engines; Commercial Aircraft; Low Noise*

**20080001472** Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

**Marine Mammal Detection: Call-Up Against the Noise Monitoring Standing Offer**

Glessing, Brad; Hood, Joe; Mar 2006; 42 pp.; In English; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707-04-2801

Report No.(s): AD-A472971; DRDC-ATLANTIC-CR-2005-271; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents the work done to prototype a marine mammal detection system. The resulting system will support environmental mitigation measures prior to, and during, active sonar trials and exercises. A working application was delivered at the end of the call-up that allows a user to configure and run detection processing, with live updates provided, or to post-analyze data from a previous detection run. Once selected, an image of the detection and the corresponding detection log entries are presented to the user. The user can also listen to the detection and bring up a time series plot of the raw data. A cursor can be used to measure times and frequencies on the detection image. This system was used to process 30 minutes of Right whale data collected using sonobuoys. Desharnais collected this data set in the Bay of Fundy during the summer of 1999. This data set included dead channels, considerable radio frequency (RF) interference and a digital data channel. Fifty-seven

valid detections were made while the sixteen false alarms that did occur were easily classified and rejected. No analysis of missed contact was made. After a quick look at the data, it took an acoustic operator less than a second to distinguish a valid call from a false alarm as he scrolled through the results. Aural listening helped to quickly distinguish valid vs. invalid contacts. There is still considerable room for improvement in the automatic classification and graphical user interface (GUI) layout but, as a prototype, it demonstrates that good detections can be made and classified using a system such as this. The processing stream is based primarily on existing signal processing library (SPLIB) and sonar library (SONLIB) modules developed under previous call-ups. The GUI was based on existing QT-based widgets developed under the Omni Passive Display (OPD) call-up.

DTIC

*Animals; Marine Biology; Marine Mammals; Sound Detecting and Ranging*

**20080001477** Xwave, Halifax, Nova Scotia Canada

**Reverberation Inversion Enhancements Using BASE 04 Data**

Cainan, C; Oct 2006; 52 pp.; In English

Contract(s)/Grant(s): W7707-06-2983

Report No.(s): AD-A472984; DRDC-ATLANTIC-CR-2006-046; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Previous contracts resulted in the development and use of the program BREVER, which performs reverberation inversion using the sonar analysis suite DMOS (DRDC Atlantic Model Operating System). A more recent contract allowed for the expansion of DMOS to incorporate the use of the ray trace program Bellhop as an alternative to the normal mode theory program PMODES. The current contract called for the expansion of BREVER so that it is able to use the Bellhopenabled version of DMOS. A User's Guide for the newly expanded version of BREVER was also to be written as a separate document. Both of these tasks were accomplished. Initial testing of the BASE 04 sea trial configuration, performed as a prelude to analysis of that data, revealed a limitation of Bellhop previously unknown to both the author and the Scientific Authority. This limitation prevented using the expanded version of BREVER to perform reverberation inversion on the BASE 04 data, which was the last task on the current contract.

DTIC

*Augmentation; Inversions; Reverberation; Underwater Acoustics*

**20080001481** Xwave, Halifax, Nova Scotia Canada

**DMOS - Bellhop Extension**

Calnan, C; Feb 2006; 32 pp.; In English

Contract(s)/Grant(s): W7707-05-2934

Report No.(s): AD-A472983; DRDC-ATLANTIC-CR-2006-005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The current contract contains requirements to enhance the sonar analysis suite DMOS to incorporate the use of the ray trace program Bellhop, and then to produce an updated version of the DMOS User's Guide. The current document is a report on the project in general, describing the enhancement of DMOS and indicating changes made to existing members of that analysis suite necessitated by the addition of Bellhop. An updated User's Guide is provided in a separate document.

DTIC

*Reverberation; Sonar*

**20080001898** Naval Academy, Annapolis, MD USA

**Nonlinear Acoustic Landmine Detection: Profiling Soil Surface Vibrations and Modeling Mesoscopic Elastic Behavior**

Genis, Sean A; May 4, 2007; 122 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473345; USNA-TSPR-352; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Acoustic-to-seismic (A/S) coupling involving airborne sound is used to generate soil vibrations that interact with the top plate of a buried landmine. Due to scattering, the interaction at the soil-mine interface produces an enhanced and strongly nonlinear soil surface vibration directly over the buried landmine. Resonant tuning curves of the soil-mine system show that the nonlinear behavior observed near resonance for 'on the mine' locations is considerably stronger than that seen 'off the mine.' This suggests that some false alarms due to the resonant effects of the ground's natural layering may be eliminated by comparing the frequency softening in resonant tuning curves between 'off' and 'on target' locations. Experiments with the soil-mass oscillator (SMO) apparatus show that the nonlinear acoustic landmine detection problem involves mesoscopic

nanoscale nonlinear elastic behavior. Resonant tuning curves have linear backbones, a behavior also characteristic of certain geomaterials (sandstone) Elasto-slip (Iwan 1966) and LISA (Scalerandi et al 2002) models of hysteresis are used to explain this phenomenon. The soil-mine interface, which is modeled using a soil-plate oscillator (SPO) apparatus, is extremely nonlinear. The SPO is excited using both acoustic and electromagnetic means. A/S coupling experiments are employed to simultaneously measure vibrations at the underside of a buried clamped plate and the soil surface. Electrodynamic experiments determine the motional impedance of a combined soil-plate system. Nonlinear acoustic landmine detection experiments are performed in the anechoic chamber facility using both a buried acrylic drum-like mine simulant and a VS 1.6 plastic anti-tank landmine. Using an automated laser Doppler vibrometer, soil surface vibrations are profiled as a function of scan position. Elements of both the elasto-slip and bilinear hysteresis models appear in these experiments.

DTIC

*Acoustic Sounding; Hysteresis; Mine Detectors; Mines (Ordnance); Nonlinearity; Soils; Sound Detecting and Ranging; Vibration*

**20080001950** Naval Postgraduate School, Monterey, CA USA

**Extensible 3D (X3D) Graphics for Visualizing Marine Mammal Reaction to Underwater Sound on the Southern California ASW Range (SOAR)**

Thompson, Stephanie; Jun 2007; 128 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473451; No Copyright; Avail.: Defense Technical Information Center (DTIC)

U.S. Navy use of sonar is essential for national defense, but its potential impacts on marine mammals are not well understood. Predictive models have been developed, but the need still exists for modeling actual marine mammal reaction during Navy exercises. The goal of this thesis is to develop a tool that can assimilate data collected from on-range exercises for visualizing and quantifying marine mammal reactions to underwater sound. In this thesis, X3D Graphics is used to model an acoustic source, as well as visualize acoustic and GPS tracking data collected during exercises. Generating geo-referenced, time synchronized 3D scenes of an August 2006 test, marine mammal positions and tracks of two research boats are displayed over realistic bathymetry. From a separate August 2004 experiment, acoustic transmissions and tracking of a training target are modeled. These demonstrate the essential components needed for visualization of marine mammal reactions during an ASW exercise. Potential future work includes utilizing this system to model multiple SOAR exercises, which will provide baseline data analyses to better understand marine mammal vulnerabilities and improve Navy mitigation procedures.

DTIC

*Acoustics; Animals; Marine Biology; Marine Mammals; Sonar; Sound Transmission; Tracking (Position); Underwater Acoustics*

**20080002262** NASA Langley Research Center, Hampton, VA, USA

**A Fast Method of Deriving the Kirchhoff Formula for Moving Surfaces**

Farassat, F.; Posey, Joe W.; November 27, 2007; 16 pp.; In English; 154th Meeting of the Acoustical Society of America, 27 Nov. - 1 Dec. 2007, New Orleans, LA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.07.18.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002262>

The Kirchhoff formula for a moving surface is very useful in many wave propagation problems, particularly in the prediction of noise from rotating machinery. Several publications in the last two decades have presented derivations of the Kirchhoff formula for moving surfaces in both time and frequency domains. Here we present a method originally developed by Farassat and Myers in time domain that is both simple and direct. It is based on generalized function theory and the useful concept of imbedding the problem in the unbounded three-dimensional space. We derive an inhomogeneous wave equation with the source terms that involve Dirac delta functions with their supports on the moving data surface. This wave equation is then solved using the simple free space Green's function of the wave equation resulting in the Kirchhoff formula. The algebraic manipulations are minimal and simple. We do not need the Green's theorem in four dimensions and there is no ambiguity in the interpretation of any terms in the final formulas. Furthermore, this method also gives the simplest derivation of the classical Kirchhoff formula which has a fairly lengthy derivation in physics and applied mathematics books. The Farassat-Myers method can be used easily in frequency domain.

Author

*Green's Functions; Noise Prediction; Wave Equations; Helicopters*

**20080002268** NASA Langley Research Center, Hampton, VA, USA

**Impact of Air Injection on Jet Noise**

Henderson, Brenda; Norum, Tom; December 04, 2007; 29 pp.; In English; Fall Acoustics Technical Working Group, 4-5 Dec. 2007, Cleveland, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 984754.02.07.07.17.03; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002268>

The objective of this viewgraph presentation is to review the program to determine impact of core fluidic chevrons on noise produced by dual stream jets (i.e., broadband shock noise - supersonic, and mixing noise - subsonic and supersonic). The presentation reviews the sources of jet noise. It shows designs of Generation II Fluidic Chevrons. The injection impacts shock structure and stream disturbances through enhanced mixing. This may impact constructive interference between acoustic sources. The high fan pressures may inhibit mixing produced by core injectors. A fan stream injection may be required for better noise reduction. In future the modification of Gen II nozzles to allow for some azimuthal control: will allow for higher mass flow rates and will allow for shallower injection angles A Flow field study is scheduled for spring, 2008 The conclusions are that injection can reduce well-defined shock noise and injection reduces mixing noise near peak jet noise angle CASI

*Aerodynamic Noise; Flow Distribution; Jet Aircraft Noise; Gas Injection; Nozzle Flow; Noise Reduction*

**20080002347** Naval Postgraduate School, Monterey, CA USA

**Modeling of High-Frequency Acoustic Propagation in Shallow Water**

Torres, Juan C; Jun 2007; 150 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473494; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473494>

This research involves numerical modeling of acoustic signals through shallow water channels. The sound is computationally modeled in a vertical plane as a dense fan of beams radiating from the transmitter location. The cross section of each 2-dimensional beam is represented as a Gaussian distribution of acoustic energy. The Gaussian beam travels axially along rays governed by Snell's Law, dispersing in width as a function of travel distance. At arbitrary receiver locations in the planar sound field, the intensity of the propagated beams is integrated over time to synthesize the multipath channel response. The influence of the ocean channel is analyzed parametrically, including sensitivity of the eigenray structure and impulse response to water properties, channel boundaries, and source/receiver geometry. Specific maritime environments examined in this study are St. Andrew Bay, Panama City, FL, and Chesapeake Bay, Little Creek, VA. This research supports the possible use of high frequency acoustics (40-70 kHz) for short-range (500 m) through-water communications. Emphasis is on communications between seabed stations.

DTIC

*Acoustic Propagation; Shallow Water; Signal Transmission; Sound Waves*

**20080002365** Woods Hole Oceanographic Inst., MA USA

**Characterizing Variability in the Distribution of High-Frequency Acoustic Backscattering in a Shallow Water Coastal Region**

Lawson, Gareth L; Stanton, Timothy K; Wiebe, Peter H; Aug 2007; 8 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0212

Report No.(s): AD-A473526; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473526>

The central purpose of this ONR Graduate Traineeship Award in Ocean Acoustics was for the Primary Investigator, Gareth Lawson, to design, execute, and defend his doctoral dissertation research, with the Co-Primary Investigators, Timothy K. Stanton and Peter H. Wiebe, acting as advisors. In terms of its scientific goal, the project examined the physical and biological factors underlying variability in the distribution of high-frequency acoustic volume backscattering stemming from zooplankton. The specific research objectives were: 1. To quantify spatial and temporal variability in zooplankton distribution, and hence the distribution of uncertainty in the acoustic field, in shallow water coastal regions. 2. To assess the predictability and persistence of such patchiness, and understand its association with physical and biological oceanographic processes. 3. To continue the process of field-testing and refining zooplankton scattering models.

DTIC

*Acoustic Scattering; Backscattering; Coasts; Shallow Water; Variability*

**20080002442** Air Force Research Lab., Edwards AFB, CA USA

**Dark Core Analysis of Coaxial Injectors at Sub-, Near-, and Supercritical Pressures in a Transverse Acoustic Field (Postprint)**

Leyva, Ivett A; Talley, Douglas; Chehroudi, Bruce; Jun 13, 2007; 19 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473665; AFRL-PR-ED-TP-2007-327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473665>

An experimental study on the effects of an externally-imposed transverse acoustic field in a N<sub>2</sub> shear coaxial jets at sub-, near-, and supercritical pressures is presented. Such fields and their interaction with the jets (i.e., breakup, mixing, etc.) are believed to play a critical role during combustion instabilities in liquid rocket engines. The shear coaxial injector used here is similar to those used in cryogenic liquid rockets. By using N<sub>2</sub> as the working fluid, the chemistry effects on combustion instability are separated from the effects of a transverse acoustic field on coaxial jets. Furthermore, through this choice, ambiguities associated with composition dependence on mixtures critical properties are eliminated. The acoustic field is generated by a piezo-siren and the first resonance frequency is ~3kHz. The pressures in the chamber range from 215-716 psia to span subcritical to supercritical pressures. The outer to inner jet velocity ratio varies from ~1.2 to 23 and the momentum flux ratio (MR) varies from ~0.2 to 23. These ratios are mainly varied by changing the temperature and flow rates of the outer jet. At least 2000 backlit images were taken at 41kHz for each run. The main metric investigated is the length of the dark, or inner jet, core. This length is related to the mixing processes in a coaxial jet. The shorter the core length the faster the mixing occurs. Both the axial and the total, or curved, dark core lengths are studied. For momentum flux ratios  $1 < MR < 4$  the differences in the axial and curved dark core lengths between acoustics on and off are statistically significant, which means acoustics do shorten the core for this range. For subcritical pressures the MR range where the jet is shortened is larger. Preliminary results on the frequency analysis of the dark core lengths and width is also presented.

DTIC

*Acoustics; Combustion; Injectors; Sound Fields; Stability; Supercritical Pressures*

**20080002568** Naval Postgraduate School, Monterey, CA USA

**A Modular Approach to Time-Based UAN Simulation Development**

Betancourt, Richard; Sep 2007; 133 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473719; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The necessity to project naval combat power throughout the littorals has resulted in the explosion of growth in the development and implementation of wireless underwater networks. Contrary to the terrestrial wireless signal, which uses electromagnetic (radio) signals as a medium for the transfer of data, an underwater network utilizes acoustic signals to carry data. Additionally, unlike the terrestrial counterpart, the underwater acoustic network operates in a dynamic, ever changing environment that is susceptible to dramatic shifts in ocean water columns that are influenced by numerous parameters, e.g., density, temperature, depth, and current. Couple this with the mechanical impediments of electronic equipment, operating in a waterborne environment, and the problems begin to multiply exponentially. This thesis presents a new, standardized application programming interface for the development of acoustic physics models and network protocol stacks that can be dynamically loaded into an underwater acoustic network simulator. The interface will meet the needs of the USA Navy, scientific organizations, and private parties, by providing a key building block of a robust, modular based simulation framework that will allow rapid and cost saving research and development and testing of underwater networking technologies.

DTIC

*Simulation; Underwater Acoustics; Wireless Communication*

**20080002588** Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

**Toxicity of the Cyclic Nitramine Energetic Material CL-20 to Aquatic Receptors**

Haley, Mark V; Anthony, John S; Davis, Emily A; Kurnas, Carl W; Kuperman, Roman G; Checkai, Ronald T; Oct 2007; 22 pp.; In English

Report No.(s): AD-A473749; ECBC-TR-569; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We investigated the effects of the cyclic nitramine energetic material CL-20 (2,4,6,8,10,12-hexanitro-2,4,6,8, 10,12-hexaazaisowurtzitane) on *Ceriodaphnia dubia* (water flea), *Pimephales promelas* (fathead minnow), and *Selenastrum capricornutum* (green single celled algae). We designed experiments to include two types of exposure: (1) direct amendments of CL-20 to test media, and (2) aquatic elutriates from Sassafras Sandy Loam (SSL) soil amended with various concentrations of CL-20. Selected exposure routes that we simulated for testing included the potential toxicity of CL-20 to aquatic receptors

resulting from direct CL-20 release into the aquatic environment, and from contaminated surface soil runoff. CL-20 concentrations in aquatic media were determined using a modified USEPA Method 8330, then correlated with reproduction or growth endpoints using nonlinear regression models to determine the respective IC(sub 20) and IC50 values for CL-20. Experiments using direct amendments of CL-20 to test media resulted in 1020 values of 2.0 mg L for *P. promelas* (growth), 1.2 mg L(exp -1) for *C. dubia* (reproduction), and 31 mg L(exp -1) for *S. capricornutum* (growth). In experiments using elutriates from SSL soil amended with CL-20 resulted in 1020 values of 1.4 mg L(exp-1) for *P. promelas* (growth), 1.1 mg L(exp -1) for *C. dubia* (reproduction) and >8 mg L(exp -1) for *S. capricornutum* (growth).

DTIC

*Marine Biology; Nitramine Propellants; Soils; Surface Water; Toxicity*

**20080002595** Maryland Univ., College Park, MD USA

**Spike Sorting at the Electrode: Neural Ensemble Recording from the Flying Bat**

Horiuchi, Timothy K; Aug 2006; 4 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0188

Report No.(s): AD-A473757; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our laboratory has been working towards completion of an adaptive clustering spike-sorting circuit and the acquisition of bat vocalizations from a flying bat. In this summary for the project, we show some basic operation of the spike-sorting chip and discuss issues for further development. We have successfully flown a radio telemetry microphone on a bat and recorded good signals for the beginning of a new series of bat behavioral experiments.

DTIC

*Bats; Circuits; Echoes; Position (Location)*

**20080002613** Naval Research Lab., Washington, DC USA

**Ship-Induced Noise Predictions in the Atlantic and the Pacific: A Comparison of Two Noise Models**

Heitmeyer, Richard; Wales, Stephen C; Pflug, Lisa A; Hayward, Thomas J; Schurman, Iman W; May 30, 2006; 75 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-6053

Report No.(s): AD-A473782; NRL/FR/7121--06-10; 123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes differences in the ship-induced, bearing-elevation, noise directionality obtained from different noise models and interprets those differences in terms of the propagation and the environmental components of those models. The two noise models, RANDI and APL, both compute the noise as the incoherent sum of the individual ship contributions; they differ in both their propagation models (ANM and FEPE) and in their environmental models. The directionalities are computed for both the Sargasso Sea and the Gulf of Alaska. The Sargasso Sea results differ significantly with the APL directionality, showing lower levels and a much deeper noise notch. In the Gulf of Alaska, the directionalities are much more similar, with both exhibiting deeper noise notches than in the Sargasso Sea. The disparity in the Sargasso Sea noise notch results primarily because, for the ANM model, the set of modes excited by sources near the continental shelf is disjoint from the modes observed by the array. For the Gulf of Alaska, this 'mode-set-disjunction' does not occur, and hence, the ANM more realistically estimates the downslope propagating contributions.

DTIC

*Acoustic Propagation; Ambience; Environment Effects; Gulf of Alaska; Models; Noise (Sound); Noise Prediction; Sargasso Sea; Ships*

## 72

### ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

**20080001051** Army Research Lab., Adelphi, MD USA

**Surface Analysis of Reactive Ion Etched PZT Thin Films in SF6 Plasma**

Zakar, Eugene; Sep 2007; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472738; ARL-TR-4284; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472738>

Reactive ion etching of sol-gel deposited Pb(Zr(0.52)Ti(0.48)O<sub>3</sub>) thin films was performed in SF<sub>6</sub> plasmas. Etch rate was

determined as a function of cathode power and chamber pressure, attaining a value of 65 nm/min at 300 W. Auger electron spectroscopy measurements revealed an excess Pb 10 nm thin layer on as-deposited film surfaces. X-ray photoelectron spectroscopy measurements showed the existence of ZrF<sub>4</sub> and PbSO<sub>4</sub> species on etched surfaces, in addition to traces of S and F. These measurements also indicated that Ti is relatively easy to remove while Pb removal is the rate limiting step in the etch process.

DTIC

*Auger Spectroscopy; Electron Spectroscopy; Etching; Plasmas (Physics); Reactivity; Sulfur Hexafluoride; Thin Films*

**20080001504** Defence Research and Development Suffield, Suffield, Alberta Canada

**Computational Simulation of Vibrational Overtone Spectral Regions: Sarin**

Petryk, M W; Dec 2006; 52 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472801; DRDC-S-TR-2006-220; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In sarin (isopropyl methylphosphonofluoridate) there are ten nonequivalent CH oscillators. Ab initio calculations at the HF / 6-311++G(2d,2p) level have been used to determine the vapour phase local mode parameters,  $\omega$  and  $\omega_x$ , for each oscillator in the two spectrally significant conformers of sarin, as well as inter-oscillator coupling parameters. These above parameters, in conjunction with dipole moment functions derived from ab initio calculations, were used to perform harmonically coupled anharmonic oscillator (HCAO) calculations, thereby enabling the simulation of vibrational overtone spectral regions in a room-temperature sample of sarin. It was determined that the computationally-intensive HCAO approach is necessary to predict the lower vibrational overtone regions (i. e., first to third overtones) as a simpler 'non-HCAO' approach (which does not allow pairwise harmonic coupling among adjacent oscillators) failed to accurately reproduce the HCAO-simulated spectral regions. The present work, which was carried out without recourse to the experimental sarin spectral regions, illustrates that it is currently feasible to predict the absorption spectra of species which are difficult to synthesize, handle, or otherwise acquire. In addition to their utility in guiding experimental investigations, the simulated overtone spectral regions will be necessary to correctly assign experimental overtone spectra owing to the large number of similar but nonequivalent CH oscillators present in sarin.

DTIC

*Absorption Spectra; Computerized Simulation; Simulation; Spectra; Vibration*

**20080001660** Indian Inst. of Tech., New Delhi, India

**Ion Beam Induced Softening of a Nanoelectromechanical Actuator**

Singh, Jitendra; Aug 9, 2007; 10 pp.; In English

Contract(s)/Grant(s): FA520906P0158

Report No.(s): AD-A473130; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473130>

A novel method of engineering the mechanical properties of individual nanostructures is reported. The method of ion irradiation serves as a non-destructive tool to manipulate the spring constant values of isolated nanorods. The slanted Si nanorods were grown by glancing angle deposition (GLAD) technique on a patterned Si(100) substrate with tungsten posts arranged in a 1 micron x 1 micron square pattern. Another Cr nanorods sample were deposited over the Silica balls on Si substrate. The resulting slanted Si nanorods are well separated allowing us to study the mechanical properties of individual nanorods. An atomic force microscope was used in force-distance spectroscopy mode to determine the spring constant value of a single nanorod. The Young's modulus of the Si nanorods undergone remarkable change by 62% after the ion beam irradiation. The sample (at 80K temperature) was irradiated by 100 MeV Ag<sup>+8</sup> ions at a fluence of 10<sup>14</sup> ions/cm<sup>2</sup>. The micro-Raman studies over Si nanorods before and after the irradiation show the presence of nanocrystalline regions within the Si nanorods which got amorphized after the irradiation. The ion beam induced enhancement in the amorphization and defects such as vacancies results in the softening of these nanorods. Nanoindentation studies on the Cr metal nanorods after irradiating with fluence varying from 10<sup>12</sup> to 10<sup>14</sup> ions/cm<sup>2</sup> was performed. The results show a 7 fold enhancement in the hardness value of the Cr nanorods after irradiating with fluence value of 10<sup>14</sup> ions/cm<sup>2</sup>. The results are very encouraging to use ion beam as a modification tool for tailoring the mechanical properties.

DTIC

*Actuators; Ion Beams; Mechanical Properties; Nanostructures (Devices); Nanotechnology; Softening*

**20080001662** Hokkaido Univ., Sapporo, Japan

**Ab Initio Direct Trajectory Simulation on Hydrogen Atom Transfer in 7-Azaindole in the Electronic Excited State with Assist of Water Molecules**

Taketsugu, Tetsuya; Jul 14, 2006; 6 pp.; In English

Contract(s)/Grant(s): FA520905P0515

Report No.(s): AD-A473132; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473132>

The work focused on the simulation of (1) direct trajectory on the excited proton transfer in the 7-azaindole (7AI) assisted by water molecules, (2) a vibrational consistent-field study of vibrational spectrum of 7AI-H<sub>2</sub>O, and (3) an ab initio study of reaction mechanism of double proton transfer in the 7AI-dimer in the excited states. The present vibrational self-consistent field (VSCF) / ab initio quartic force field (QFF) applications to 7AI-H<sub>2</sub>O system is the largest application among the previous studies, which needs a lot of nodes of computers to carry out these calculations in parallel. This study has been published in the special issue of Modeling of Vibrational Spectroscopies (Taketsugu et al. *IJQC*, 104, 758-772, 2005).

DTIC

*Electron States; Excitation; Hydrogen Atoms; Hydrogen Bonds; Molecular Dynamics; Molecules; Simulation; Trajectories; Water*

**20080002402** Devaney (Anthony J.) Associates, Boston, MA USA

**Computational Analysis of Hybrid Two-Photon Absorbers with Excited State Absorption**

Potasek, M J; Mar 2007; 18 pp.; In English

Contract(s)/Grant(s): FA9550-04-C-0036

Report No.(s): AD-A473583; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473583>

This work represents the joint work of several groups including numerical calculations and experiments. Numerical calculations were performed for the propagation of a femtosecond laser beam through an optical path and a nonlinear absorber. The results were compared with experiments performed under similar conditions. There was excellent agreement between calculations and experiments at low input energy. However, further additions must be done to the calculation of the optical path for high input energy.

DTIC

*Analysis (Mathematics); Excitation; Photons*

**20080002574** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Effects of Solvation on One- and Two-Photon Spectra of Coumarin Derivatives: A Time-Dependent Density Functional Theory Study (Postprint)**

Pachter, Ruth; Nguyen, Kiet A; Day, Paul N; Jan 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473729; AFRL-ML-WP-TP-2007-556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report one- and two-photon absorption excitation energies and cross sections for a series of 7-aminocoumarins using time-dependent density functional theory with various basis sets and functionals, including exchange-correlation functionals using the Coulomb-attenuating method, to evaluate their performance in the gas phase and in solvents. Except for the results of one functional, the computed one-photon excitation energies and transition dipole moments are in good agreement with experiment. The range of errors obtained from various functionals is discussed in detail. The relationship of donor and acceptor groups with the one- and two-photon resonances and intensities is also discussed.

DTIC

*Anhydrides; Density Functional Theory; Esters; Photons; Solvation; Spectra; Time Dependence*



**20080002631** Universal Energy Systems, Inc., Dayton, OH USA

**Effects of Conjugation in Length and Dimension on Spectroscopic Properties of Fluorene-Based Chromophores from Experiment and Theory (Postprint)**

Tan, Loon-Seng; Fleitz, Paul A; Patchter, Ruth; Nguyen, Kiet A; Rogers, Joy E; Slagle, Jonathan E; Day, Paul N; Kannan, Ramamurthi; Jan 2006; 14 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473816; AFRL-ML-WP-TP-2007-562; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A series of one-photon absorption spectra for fluorene-based donor-pi-acceptor molecules is presented and spectroscopically assigned, based upon the results obtained from time-dependent density functional theory. The computed excitation energies were generally shown to be in good agreement with experiment, particularly when compared to results from measurements carried out in a nonpolar solvent, which were available for some molecules. The computed oscillator strengths may resolve discordant experimental values in some cases, for example, for AF-380, AF-270, and AF-295. However, a quantitative comparison between computed and observed oscillator strengths is complicated by band overlapping. Thus, the computed extinction coefficients obtained by summing over the Gaussian bands are useful in such cases.

DTIC

*Chromophores; Conjugation; Length; Photons; Spectroscopy*

### 73

## NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

**20080001018** Library of Congress, Washington, DC USA

**Nonproliferation and Threat Reduction Assistance: U.S. Programs in the Former Soviet Union**

Wolf, Amy F; Jun 17, 2004; 53 pp.; In English

Report No.(s): AD-A472670; CRS-RL31957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472670>

Congress passed the Nunn-Lugar amendment, authorizing U.S. threat reduction assistance to the former Soviet Union, in November 1991, after a failed coup in Moscow and the disintegration of the Soviet Union raised concerns about the safety and security of Soviet nuclear weapons. The annual program has grown from \$400 million in the Department of Defense (DoD) budget to over \$900 million across three agencies -- DoD (\$409.2 million), Department of Energy (DOE) (\$439 million), and the State Department (DOS) (\$70 million). It also has evolved from an emergency response to impending chaos in the Soviet Union, to a more comprehensive threat reduction and nonproliferation effort, to a broader program seeking to keep nuclear, chemical, and biological weapons from leaking out of the former Soviet Union and into the hands of rogue nations or terrorist groups. The DoD manages the Cooperative Threat Reduction (CTR) Program, which provides Russia, Ukraine, Belarus, and Kazakhstan with assistance in transporting, storing, and dismantling nuclear, chemical, and biological weapons. U.S. assistance has helped these nations eliminate the delivery systems for nuclear weapons under the START I Treaty, secure weapons storage areas, construct a storage facility for nuclear materials removed from weapons, construct a destruction facility for chemical weapons, and secure biological weapons materials. The DOS manages the International Science and Technology Centers in Moscow and Kiev. These centers provide research grants to scientists and engineers so that they will not sell their knowledge to other nations or terrorist groups. The DOS also has provided assistance with export and border control programs in the former Soviet states. The DOE manages programs that seek to improve the security of nuclear materials at civilian, naval, and nuclear weapons complex facilities. This report discusses numerous issues related to U.S. nonproliferation and threat reduction assistance.

DTIC

*Biological Weapons; Chemical Warfare; Disarmament; Law (Jurisprudence); Nuclear Weapons; Security; U.S.S.R.*

**20080001019** Library of Congress, Washington, DC USA

**Nonproliferation and Threat Reduction Assistance: U.S. Programs in the Former Soviet Union**

Wolf, Amy F; Apr 19, 2005; 55 pp.; In English

Report No.(s): AD-A472671; CRS-RL31957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472671>

Congress passed the Nunn-Lugar amendment, authorizing U.S. threat reduction assistance to the former Soviet Union, in

November 1991, after a failed coup in Moscow and the disintegration of the Soviet Union raised concerns about the safety and security of Soviet nuclear weapons. The annual program has grown from \$400 million in the Department of Defense (DoD) budget to over \$1 billion across three agencies -- DoD (\$415.5 million), Department of Energy (DOE) (\$529.9 million), and the State Department (DOS) (\$71 million). It also has evolved from an emergency response to impending chaos in the Soviet Union, to a more comprehensive threat reduction and nonproliferation effort, to a broader program seeking to keep nuclear, chemical, and biological weapons from leaking out of the former Soviet Union and into the hands of rogue nations or terrorist groups. The DoD manages the Cooperative Threat Reduction (CTR) Program, which provides Russia, Ukraine, Belarus, and Kazakhstan with assistance in transporting, storing, and dismantling nuclear, chemical, and biological weapons. U.S. assistance has helped these nations eliminate the delivery systems for nuclear weapons under the START I Treaty, secure weapons storage areas, construct a storage facility for nuclear materials removed from weapons, construct a destruction facility for chemical weapons, and secure biological weapons materials. The DOS manages the International Science and Technology Centers in Moscow and Kiev. These centers provide research grants to scientists and engineers so that they will not sell their knowledge to other nations or terrorist groups. The DOS also has provided assistance with export and border control programs in the former Soviet states. The DOE manages programs that seek to improve the security of nuclear materials at civilian, naval, and nuclear weapons complex facilities. This report discusses numerous issues related to U.S. nonproliferation and threat reduction assistance.

DTIC

*Biological Weapons; Chemical Warfare; Disarmament; Law (Jurisprudence); Nuclear Weapons; Security; U.S.S.R.*

**20080001020** Library of Congress, Washington, DC USA

**Nonproliferation and Threat Reduction Assistance: U.S. Programs in the Former Soviet Union**

Woolf, Amy F; Apr 6, 2006; 59 pp.; In English

Report No.(s): AD-A472672; CRS-RL31957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472672>

Congress passed the Nunn-Lugar amendment, authorizing U.S. threat reduction assistance to the former Soviet Union, in November 1991, after a failed coup in Moscow and the disintegration of the Soviet Union raised concerns about the safety and security of Soviet nuclear weapons. The annual program has grown from \$400 million in the Department of Defense (DoD) budget to around \$1.1 billion across three agencies -- DoD (\$372.2 million), Department of Energy (DOE) (\$682.6 million), and the State Department (DOS) (\$63 million). It also has evolved from an emergency response to impending chaos in the Soviet Union, to a more comprehensive threat reduction and nonproliferation effort, to a broader program seeking to keep nuclear, chemical, and biological weapons from leaking out of the former Soviet Union and into the hands of rogue nations or terrorist groups. The DoD manages the Cooperative Threat Reduction (CTR) Program, which provides Russia, Ukraine, Belarus, and Kazakhstan with assistance in transporting, storing, and dismantling nuclear, chemical, and biological weapons. U.S. assistance has helped these nations eliminate the delivery systems for nuclear weapons under the START I Treaty, secure weapons storage areas, construct a storage facility for nuclear materials removed from weapons, construct a destruction facility for chemical weapons, and secure biological weapons materials. The DOS manages the International Science and Technology Centers in Moscow and Kiev. These centers provide research grants to scientists and engineers so that they will not sell their knowledge to other nations or terrorist groups. The DOS also has provided assistance with export and border control programs in the former Soviet states. The DOE manages programs that seek to improve the security of nuclear materials at civilian, naval, and nuclear weapons complex facilities. This report discusses numerous issues related to U.S. nonproliferation and threat reduction assistance.

DTIC

*Biological Weapons; Chemical Warfare; Disarmament; Law (Jurisprudence); Nuclear Weapons; Security; U.S.S.R.*

**20080001243** RAND Corp., Arlington, VA USA

**Coping with Iran: Confrontation, Containment, or Engagement?**

Dobbins, James; Harting, Sarah; Kaye, Dalia D; Jan 2007; 108 pp.; In English

Report No.(s): AD-A473026; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On March 21, 2007, the RAND Corporation held a public conference on Capitol Hill, 'Coping with Iran: Confrontation, Containment, or Engagement?' featuring high-level experts and hosted by the director of the RAND International Security and Defense Policy Center. More than 300 guests attended, including former ambassadors, members of Congress and senior staffers, senior journalists, Pentagon officials, and numerous well-known Middle East analysts. Two high-level officials, Ambassador R. Nicholas Burns, Under Secretary of State for Political Affairs, and Ambassador Mohammad Javad Zarif, Iranian Ambassador to the UN (via videoconference), also shared their national perspectives with the audience. Conference

participants sought to facilitate an informed discussion of the benefits and drawbacks of various policy options to address the Iranian challenge. This report summarizes remarks presented during the conference. The views expressed in this document are those of the participants, as interpreted by the RAND Corporation.

DTIC

*Containment; International Relations; Iran*

**20080001628** Australian National Univ., Canberra, Australia

**Two-Photon Absorption Measurements: Establishing Reference Standards**

Samoc, Marek; Samoc, Anna; Fleitz, Paul A; Jun 8, 2007; 19 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0082

Report No.(s): AD-A473083; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473083>

Two-Photon Absorption 'TPA' is an important phenomenon taking place at high light intensities and consisting in simultaneous absorption of two low energy photons to generate a higher energy excited state of a material. Materials showing efficient two-photon absorption are required for a number of applications including information storage, photonic signal processing, optical power limiting, nonlinear microscopy of biological systems etc. This report contributes to the knowledge of parameters influencing the two-photon cross section values obtained by direct absorption measurements and provides representative data for comparison with other techniques.

DTIC

*Absorbents; Absorbers (Materials); Photonics; Photons*

## 74 OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

**20080000395** Air Force Research Lab., Kirkland AFB, NM USA

**Performance Measurements of a Self-Referencing Interferometer Wavefront Sensor with Optical Amplification (Preprint)**

Klein, Laura; Rhoadarmer, Troy A; Jul 29, 2005; 10 pp.; In English

Contract(s)/Grant(s): IN-HOUSE; (DF299962); Proj-JTO0

Report No.(s): AD-A472213; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472213>

The Self-referencing Interferometer Wavefront Sensor (SRI WFS) has been shown to outperform conventional wavefront sensors in strong scintillation environments. Recently, the Starfire Optical Range has developed a prototype SRI to evaluate its performance. This paper discusses the purposes of optically amplifying the reference beam. Specifically, it addresses regions of operation where gain improves signal-to-noise ratio (SNR) values, and thus the SRI WFS performance. Conditions are also addressed when Amplified Spontaneous Emission (ASE) from the optical amplifier degrades the overall signal, resulting in less than acceptable SNR ratios. Laboratory measurements of SRI WFS performance with an optical amplifier are presented.

DTIC

*Amplification; Interferometers; Light Amplifiers; Optical Equipment; Optical Properties; Scintillation; Signal to Noise Ratios; Wave Fronts*

**20080000399** Naval Research Lab., Washington, DC USA

**Comparing Horizontal Path C<sub>2n</sub> Measurements over 0.6 km in the Tropical Littoral Environment and in the Desert**

Chang, Mark P; Font, Carlos O; Gilbreath, G C; Oh, Eun; Distefano, Emi; Restaino, Sergio; Wilcox, Christopher; Santiago, Freddie; Jan 2007; 10 pp.; In English

Report No.(s): AD-A472218; NRL-RN-07-1226-1133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472218>

We have measured the optical turbulence structure parameter, C<sub>2n</sub>, in two extremely different locations: the first being the littoral region on the southwest coast of Puerto Rico. The second location is over the dry desert in central New Mexico. In both cases, the horizontal beam paths are approximately 0.6 km long, within 2 meters of the local surface (Puerto Rico)

and varying between 2 to 100 meters (New Mexico). We present our findings from the two datasets.

DTIC

*Deserts; Puerto Rico; Regions; Tropical Regions; Turbulence*

**2008000432** Naval Research Lab., Washington, DC USA

**Measurement of Chromatic Dispersion using the Baseband Radio-Frequency Response of a Phase-Modulated Analog Optical Link Employing a Reference Fiber**

McKinney, Jason D; Diehl, John; Sep 19, 2007; 20 pp.; In English

Report No.(s): AD-A472284; NRL/MR/5652--07-9072; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472284>

In this work we demonstrate a new technique for measuring the chromatic dispersion of an optical fiber using the baseband RF response of a phase-modulated analog optical link in concert with a well-characterized fiber that serves as a dispersion reference. We show that optical phase modulation provides increased measurement resolution and immunity to optical modulator bias-drift as compared to baseband methods utilizing optical intensity modulation. In addition, we provide a simple derivation of the dispersion response of a long analog optical link to both intensity- and phase-modulated signals and derive simple expressions for the resolution of baseband chromatic dispersion measurements employing both types of modulation.

DTIC

*Color; Fiber Optics; Frequency Response; Optical Communication; Phase Modulation; Photonics; Radio Frequencies; Transmission Lines*

**2008000859** NASA Glenn Research Center, Cleveland, OH, USA

**A Parallel-Beam Approach to Obtaining Orientation and Structure Data from Closely Index-Matched Colloidal Crystals Using Optical Microscopy**

Rogers, Richard B.; Lagerlof, K. Peter D.; [2007]; 31 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 825080.01.02.20.01; Copyright; Avail.: Other Sources

A technique is described for determining the reciprocal lattice basis vectors of randomly oriented colloidal crystals from optical Fourier transform (OFT) images using a parallel incident beam. This approach is demonstrated by comparing information gathered using this technique with results from real space images for a single colloidal crystal grain with a random hexagonal close-packed (rhcp) structure. The reciprocal space and available real space results agreed to within experimental error. The complete set of reciprocal lattice basis vectors was determined using the proposed technique in contrast to the partial lattice information available from real space images. This technique appears to be generally capable of measuring lattice parameters to within 1% and orientation to better than 1deg.

Author

*Lattice Parameters; Fourier Transformation; Colloids; Single Crystals; Microscopy*

**20080001142** Rensselaer Polytechnic Inst., Troy, NY USA

**Concurrent MR-NIR Imaging for Breast Cancer Diagnosis**

Yazici, Birsen; Jun 2007; 124 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0559

Report No.(s): AD-A472775; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary objective of this research program is to investigate concurrent near infrared (NIR) optical and magnetic resonance (MR) imaging for breast cancer diagnosis. The NIR diffuse optical imaging offers novel criteria for cancer differentiation with the ability to measure (in vivo) oxygenation and vascularization state, the uptake and release of contrast agents and chromophore concentrations with high sensitivity. However, NIR diffuse optical tomography is inherently a low spatial resolution imaging modality due to diffuse nature of light photons. Alternatively, MRI provides high spatial resolution with excellent tissue discrimination, but has limited ability to monitor hemoglobin dynamics and other contrast mechanisms that optical imaging provides. Therefore, concurrent MRI-NIR optical imaging brings together the most advantageous aspects of the two imaging modalities for breast cancer diagnosis.

DTIC

*Breast; Cancer; Diagnosis; Images; Imaging Techniques; Mammary Glands*

**20080001181** Air Force Research Lab., Kirkland AFB, NM USA

**Primary and Secondary Superresolution by Data Inversion (Postprint)**

Matson, Charles; Tyler, David W; Jun 6, 2005; 16 pp.; In English

Contract(s)/Grant(s): F29601-01-D-0083-0006; Proj-2304

Report No.(s): AD-A472895; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Super resolution by data inversion is the extrapolation of measured Fourier data to regions outside the measurement bandwidth using post processing techniques. Here we characterize super resolution by data inversion for objects with finite support using the twin concepts of primary and secondary super resolution, where primary super resolution is the essentially unbiased portion of the super resolution data and secondary super resolution is the remainder. We show that this partition of super resolution into primary and secondary components can be used to explain why some researchers believe that meaningful super resolution is achievable with realistic signal-to-noise ratios, and other researchers do not.

DTIC

*Data Processing; High Resolution; Inversions*

**20080001245** Air Force Research Lab., Kirkland AFB, NM USA

**Intensity Redistribution for Multiconjugate Adaptive Optics (postprint)**

Rhoadarmer, Troy; Beckner, Jr , Charles C; Klein, Laura M; Aug 10, 2006; 11 pp.; In English

Contract(s)/Grant(s): Proj-3152

Report No.(s): AD-A473031; AFRL-DE-PS-TP-2007-1013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Multi-Conjugate Adaptive-Optical (MCAO) systems have been proposed as a means of compensating both intensity and phase aberrations in a beam propagating through strong-scintillation environments. Progress made on implementing a MCAO system at the Starfire Optical Range (SOR), Air Force Research Laboratory, Kirtland AFB, is discussed. As a preliminary step toward controlling a two Deformable Mirror (DM) system, the first-stage intensity redistribution experiment (FIRE) examines one aspect of an MCAO system-control and compensation of wavefront intensity. Two wavefront sensors (WFS) and a single DM are employed for this experiment. One WFS is placed conjugate to the DM while the second WFS is located at a distance which produces a desired fresnel number for the propagation between the WFSS. The WFS measurements are input to a Gerchberg-Saxton based control algorithm in order to determine the DM commands. The phase pattern introduced by the DM is chosen so propagation along the path between the two WFSS produces a desired intensity profile at the second WFS. The second WFS is also used to determine the accuracy of the intensity redistribution and measure its effects on the wavefront phase. In the next phase of MCAO development, a second DM will be added conjugate to the second WFS in order to correct the remaining phase aberrations. The paper presents the setup and operation for FIRE along with initial laboratory results.

DTIC

*Adaptive Optics; Conjugates*

**20080001872** Air Force Research Lab., Kirkland AFB, NM USA

**Performance Measurements of a Self-Referencing Interferometer Wavefront Sensor with Optical Amplification-- Briefing Charts (Preprint)**

Klein, Laura; Rhoadarmer, Troy A; Jul 29, 2005; 18 pp.; In English

Contract(s)/Grant(s): Proj-JT00

Report No.(s): AD-A473316; AFRL-DE-PS-TP-2007-1015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Self-referencing Interferometer Wavefront Sensor (SRI WFS) has been shown to outperform conventional wavefront sensors in strong scintillation environments. Recently, the Starfire Optical Range has developed a prototype SRI to evaluate its performance. This paper discusses the purposes of optically amplifying the reference beam. Specifically, it addresses regions of operation where gain improves signal-to-noise ratio (SNR) values, and thus the SRI WFS performance. Conditions are also addressed when Amplified Spontaneous Emission (ASE) from the optical amplifier degrades the overall signal, resulting in less than acceptable SNR ratios. Laboratory measurements of SRI WFS performance with an optical amplifier are presented.

DTIC

*Adaptive Optics; Amplification; Charts; Interferometers; Wave Fronts*

**20080002414** Texas A&M Univ., College Station, TX USA

**Spin-Based Lattice-Gas Quantum Computers in Solids Using Optical Addressing**

Scully, Marlan O; Kocharovskaya, Olga; Welch, George; Hemmer, Philip; Zubairy, M S; Chen, Goong; Apr 30, 2007; 27 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0566

Report No.(s): AD-A473606; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473606>

The purpose of this project was to develop quantum computing hardware suitable for implementing quantum lattice-gas algorithms, with eventual application to turbulent flow simulations. A number of quantum systems were investigated, including rare-earth dopants in oxide crystals and in II-VI semiconductors. However, in the option year it was decided to concentrate exclusively on nitrogen-vacancy (NV) color centers in diamond. Surprisingly, it was found that NV diamond exhibited the key elements needed to develop few-qubit room-temperature solid-state quantum processing nodes. This included the ability to optically initialize and readout the NV electron spin state, fractional millisecond lifetimes for electron spins, and few-nanosecond electron spin Rabi flops. We also demonstrated the relatively long distance (few nanometer) coupling of a single NV spin to the electron spin of a single substitutional nitrogen (N). To achieve long range optical interconnections and entanglement between nodes, cryogenic cooling will likely still be required to sufficiently narrow the optical absorption lines. To this end we located diamond samples with unusually high purity, and found NV centers in these crystals that exhibited exceptionally narrowband and stable optical lines. We also demonstrated electric field tuning of the optical transition frequency as required for controlling atom-atom and atom-cavity coupling.

DTIC

*Addressing; Optical Data Processing; Quantum Computers; Quantum Optics; Solids*

**20080002557** Naval Observatory, Washington, DC USA

**Speckle Interferometry at the US Naval Observatory. XIII**

Mason, Brian D; Hartkopf, William I; Wycoff, Gary L; Wieder, Gary; Oct 2007; 9 pp.; In English

Report No.(s): AD-A473702; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The results of 1424 speckle interferometric observations of double stars, made with the 26 inch (66 cm) refractor of the US Naval Observatory, are presented. Each speckle interferometric observation of a system represents a combination of over 2000 short-exposure images. These observations are averaged into 1053 mean relative positions and range in separation from 0.360' to 61.92', with a median separation of 10.31'. This is the 13th in a series of papers presenting measurements obtained with this system and covers the period 2006 January 12-December 29. Included in these data are nine older measurements whose positions were previously deemed possibly aberrant but are no longer classified this way following a confirming observation. This paper also includes the first data obtained using a new 'secondary' camera, designed and built at USNO.

DTIC

*Observatories; Speckle Interferometry*

**20080002566** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Theory of Second Harmonic Generation in Presence of Diffraction, Beam Walk-Off and Pump Depletion (Preprint)**

Guha, Shekhar; Gonzalez, Leonel P; Mar 2007; 16 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473716; AFRL-ML-WP-TP-2007-491; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Integral expressions for the pump and generated fields are presented here for the case of second harmonic generation of a focused Gaussian pump beam incident on a nonlinear crystal. The birefringent walk-off of the generated beam and the effect of pump depletion are included in the theory.

DTIC

*Depletion; Diffraction; Harmonic Generations; Oscillations*

**20080002573** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Unique Anamorphic Lens Design Used for Femtosecond Micromachining in Transparent Bulk Materials (Preprint)**

Brewer, Chris; Juhl, Shane; Powers, Peter; Walker, Mark; Aug 2007; 11 pp.; In English

Report No.(s): AD-A473726; AFRL-ML-WP-TO-2007-508; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A unique anamorphic lens design was applied to a circular 780nm femtosecond laser pulse to transform it into a narrow

line spread at focus. This lens was developed to give an alternative method of micromachining bulk transparent materials. The challenge for femtosecond laser processing is to control the nonlinear affect of self-focusing, which can occur when using a fast f-number lens. Once the focused spot is dominated by self-focusing the predicted focused beam becomes a filament inside the bulk, which is an undesirable effect. The anamorphic lens resolves this self-focusing result by increasing the numerical aperture (NA) and employing an elliptical beam shape. The anamorphic lens was also designed to furnish a 2.5 um by 190 um line spread that will exceed a transparent bulk material's damage threshold in a single femtosecond laser pulse. Damage in this text refers to visual change in the index of refraction as observed under an optical microscope. Using this line spread, grating structures were micro-machined on the surface of SiC bulk transparent substrate.

DTIC

*Lens Design; Lenses; Micromachining; Optical Equipment; Transparence*

**2008002582** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Accurate Evaluation Nonlinear Absorption Coefficients for Light Propagation in InAs, InSb, and HgCdTe Alloys (Preprint)**

Krishnamurthy, Srin; Yu, Zhi G; Gonzalez, Leo; Guha, Shekhar; Jan 2007; 32 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473742; AFRL-ML-WP-TP-2007-503; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present a full-bandstructure calculation of temperature- and wavelength-dependent two-photon absorption (TPA) coefficients and free-carrier absorption (FCA) cross sections in InAs, InSb, Hg<sub>1-x</sub>Cd<sub>x</sub>Te alloys. Although the wavelength dependence of the TPA coefficients agrees well with widely used analytical expression, our calculated values are smaller by a factor of 1.2 to 2.5. In addition, the TPA coefficient depends sensitively on the photoexcited carrier density in small gap materials. The FCA is found to be due predominantly to holes. The FCA cross section is independent of the carrier density, but strongly dependent on the temperature. The calculated coefficients and lifetimes are fitted to closed-form expressions and used in solving the rate equations to obtain the transmitted pump and probe intensities as functions of incident intensity and sample thickness. The calculated pump transmission and time-dependent probe transmission in InAs agree very well with the measured values.

DTIC

*Absorptivity; Light Transmission; Mercury Cadmium Tellurides; Nonlinearity*

**20080012208** California Inst. of Tech., Pasadena, CA USA

**Electro-optical detector for use in a wide mass range mass spectrometer**

Giffin, Charles E., Inventor; May 4, 1976; 13 pp.; In English

Patent Info.: Filed September 9, 1974; US-PATENT-3,955,084; US-PATENT-APPL-SN-504455; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012208>

An electro-optical detector is disclosed for use in a wide mass range mass spectrometer (MS), in the latter the focal plane is at or very near the exit end of the magnetic analyzer, so that a strong magnetic field of the order of 1000G or more is present at the focal plane location. The novel detector includes a microchannel electron multiplier array (MCA) which is positioned at the focal plane to convert ion beams which are focused by the MS at the focal plane into corresponding electron beams which are then accelerated to form visual images on a conductive phosphored surface. These visual images are then converted into images on the target of a vidicon camera or the like for electronic processing. Due to the strong magnetic field at the focal plane, in one embodiment of the invention, the MCA with front and back parallel ends is placed so that its front end forms an angle of not less than several degrees, preferably on the order of 10.degree.-20.degree., with respect to the focal plane, with the center line of the front end preferably located in the focal plane. In another embodiment the MCA is wedge-shaped, with its back end at an angle of about 10.degree.-20.degree. with respect to the front end. In this embodiment the MCA is placed so that its front end is located at the focal plane.

Official Gazette of the U.S. Patent and Trademark Office

*Electro-Optics; Mass Spectrometers; Magnetic Fields; Photomultiplier Tubes*

**20080012215** NASA, Washington, DC USA

**Optical pantograph**

Belew, Robert R., Inventor; Davis, Donald E., Inventor; February 10, 1976; 5 pp.; In English

Patent Info.: Filed December 11, 1974; US-PATENT-3,936,942; US-PATENT-APPL-SN-531573; No Copyright; Avail.: CASI: [A01](#), Hardcopy  
ONLINE: <http://hdl.handle.net/2060/20080012215>

An optical pantograph for directing light beams and the like from a source to a receiver according to the movement of a pointer. The device can be used for, among other things, directing a laser beam and the like to a target for etching patterns on a target according to the movement of a pointer relative to a pattern trace.

Official Gazette of the U.S. Patent and Trademark Office

*Dials; Light Beams; Receivers; Laser Beams*

**20080012279** Rockwell International Corp., El Segundo, CA USA

**Fiber optic accelerometer**

August, Rudolf R., Inventor; Strahan, Virgil H., Inventor; James, Kenneth A., Inventor; Nichols, Donald K., Inventor; December 16, 1980; 9 pp.; In English

Contract(s)/Grant(s): NAS3-21005

Patent Info.: Filed July 26, 1978; US-PATENT-4,239,963; US-PATENT-APPL-SN-928222; No Copyright; Avail.: CASI: [A02](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012279>

An inexpensive, light weight fiber optic accelerometer to convert input mechanical motion (e.g. acceleration) into digitized optical output signals. The output of the accelerometer may be connected directly to data processing apparatus without the necessity of space consuming analog to digital interface means.

Official Gazette of the U.S. Patent and Trademark Office

*Accelerometers; Fiber Optics; Low Cost*

75

**PLASMA PHYSICS**

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

**20080000417** Stanford Univ., Stanford, CA USA

**Controlled Precipitation of Radiation Belt Particles**

Inan, Umran S; Bell, Timothy F; Chevalier, Timothy W; Aug 23, 2007; 18 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0338

Report No.(s): AD-A472253; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472253>

The overall objectives of this work are to: \* Quantify the requirements for controlled precipitation of radiation belt particles in order to mitigate space particle effects \* Address the issue of coupling of space based antennas to the surrounding magnetoplasma for use in system design \* Determine radiated power from single transmitting element The completion of these goals requires the design of antenna-in-plasma codes which simulate the interaction of radiating antennas and the magnetized plasma in which they are immersed. Different codes have been developed that solve various aspects of the coupling problem and that are tailored to the particular physics in the corresponding region of the coupling environment.

DTIC

*Dipole Antennas; Radiation Belts*

**20080002598** Rutgers - The State Univ., New Brunswick, NJ USA

**Basic Studies in Plasma Physics**

Lebowitz, Joel L; Oct 31, 2007; 15 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0058; Proj-2301EX

Report No.(s): AD-A473760; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary focus of this three-year basic research effort was to obtain a better understanding of the fundamental physics of electron emission from a variety of surfaces and geometries. The very nature of emission phenomena tends itself perfectly to statistical physics analyses as used herein. The major subtopics addressed (and published) in the course of this grant include the following: space-charge-limited flow of a thin electron beam confined by a strong magnetic field, space-charge-limited



flow in a rectangular geometry, ionization in a 1-D dipole model, and space-charge-limited 2-D unmagnetized flow in a wedge geometry.

DTIC

*Electron Emission; Plasma Physics; Statistical Mechanics; Theoretical Physics*

**20080002814** Air Force Research Lab., Edwards AFB, CA USA

**Operating Characteristics of Cylindrical and Annular Helicon Sources (Preprint)**

Beal, Brian E; Mak, Fabian; Sep 22, 2007; 18 pp.; In English

Contract(s)/Grant(s): Proj-33SP

Report No.(s): AD-A473588; AFRL-PR-ED-TP-2007-390; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473588>

The power required to create an ionized plasma is a significant energy loss mechanism in typical electric propulsion systems. The use of wave-driven helicon sources is one approach that has been considered as a means of reducing this loss due to the reportedly low ionization cost found in these devices. In order to extend the benefits of the helicon ionization mechanism to the widest possible array of devices, a program has been initiated to develop and demonstrate a helicon operating in an annular configuration. A 15-cm diameter helicon source has been operated on both argon and xenon gas at power levels ranging from 200 W to 3.2 kW and magnetic field strengths up to 1.6 kG for both cylindrical and annular configurations. Measurements of the resultant plasma load impedance have revealed distinct transitions to a high-resistance, visually bright regime associated with operation in the helicon mode. The qualitative similarity of the load response for both geometric configurations supports the notion that helicon sources can be created in both cylindrical and annular modes.

DTIC

*Cylindrical Bodies; Electric Propulsion; Plasmas (Physics)*

**20080012283** California Inst. of Tech., Pasadena, CA USA

**Method for generation of tunable far infrared radiation from two-dimensional plasmons**

Katz, Joseph, Inventor; October 17, 1989; 7 pp.; In English

Patent Info.: Filed October 6, 1988; US-PATENT-4,874,953; US-PATENT-APPL-SN-254141; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080012283>

Tunable far infrared radiation is produced from two-dimensional plasmons in a heterostructure, which provides large inversion-layer electron densities at the heterointerface, without the need for a metallic grating to couple out the radiation. Instead, a light interference pattern is produced on the planar surface of the heterostructure using two coherent laser beams of a wavelength selected to be strongly absorbed by the heterostructure in order to penetrate through the inversion layer. The wavelength of the far infrared radiation coupled out can then be readily tuned by varying the angle between the coherent beams, or varying the wavelength of the two interfering coherent beams, thus varying the periodicity of the photoconductivity grating to vary the wavelength of the far infrared radiation being coupled out.

Official Gazette of the U.S. Patent and Trademark Office

*Far Infrared Radiation; Plasmons*

## 76

### SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 *Electronics and Electrical Engineering*; and 36 *Lasers and Masers*.

**20080001900** North Carolina State Univ., Raleigh, NC USA

**Asymptotic Analysis of Melt Growth for Antimonide-Based Compound Semiconductor Crystals in Magnetic and Electric Fields**

Ma, Nancy; Oct 2006; 4 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0249

Report No.(s): AD-A473347; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Single crystals of doped and alloyed antimonide-based semiconductors are needed for Air Force Applications because they serve as transparent, lattice-matched epitaxial growth templates for detectors. High-performance devices rely on good

compositional homogeneity in the bulk substrate which is cut from wafers sliced from the crystal. Several important processes are being developed at AFRL in Hanscom AFB, which are the vertical gradient freezing process using submerged heater growth, the vertical Bridgman process using submerged heater growth, and the magnetic liquid- encapsulated Czochralski process. Because molten semiconductors are excellent electrical conductors, these processes apply magnetic and electric fields to control the melt motion and thus the convective transport of species during growth in order to optimize the properties of the crystal. Asymptotic and numerical modelling of these processes have provided predictions of the transport in the melt and of the compositional distribution in the crystal.

DTIC

*Antimonides; Asymptotic Series; Crystal Growth; Electric Conductors; Electric Fields; Magnetic Fields; Melts (Crystal Growth); Semiconductors (Materials)*

**20080002601** Academy of Sciences (USSR), Kiev, Russian Federation

**Transient Gain Enhancement in Photorefractive Crystals with Two Types of Movable Charge Carrier (Postprint)**

Evans, D R; Shumelyuk, A; Hryhorashchuk, A; Odoulov, S; Jul 15, 2007; 6 pp.; In English

Contract(s)/Grant(s): Proj-4348

Report No.(s): AD-A473769; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Considerable improvement of a transient two-beam coupling gain is reported for Sn<sub>2</sub>P<sub>2</sub>S<sub>6</sub>, a photorefractive crystal that possesses two types of movable charge carrier. A gain enhancement occurs if the phase difference of the interacting beams is abruptly changed to  $\pi$ . Enhancement is also achieved with periodic phase variations of zero and  $\pi$ ; between two discrete states at modulation frequencies lower than the smallest of two reciprocal characteristic times of the space-charge formation.

DTIC

*Augmentation; Charge Carriers; Crystals*

## 77

### PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics*, *73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

**20080002546** Air Force Research Lab., Edwards AFB, CA USA

**Experimental and Computational Observation of Radiometric Forces on a Plate (Postprint)**

Selden, N; Ngalande, C; Gimelshein, S; Ketsdever, A; Jun 12, 2007; 13 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473688; AFRL-PR-ED-TP-2007-322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The radiometric force on several configurations of heated plates placed in a stagnant gas is examined experimentally on a high resolution thrust stand and numerically using the direct simulation Monte Carlo method. A wide range of pressures from 0.006Pa to 6Pa corresponding to Knudsen numbers from 20 to 0.02 is examined for nitrogen, argon, xenon, and helium test gases. It is shown that the force is maximum in the transition regime ( $Kn \sim 0.1$ ) and is heavily dependent on the plate area. It is also shown that the force is strongly correlated with the chamber size, decreasing with increasing chamber size.

DTIC

*Experiment Design; Heating; Radiometers*

**20080002606** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

**Responsie van Verschillende Munitieartikelen bij Opwarming en Brand (Response of Munitions Items Due to Heating or a Fire)**

Scholtes, J H; Verboom, V; Sep 2007; 51 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473774; TNO-DV-2007-A315; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Safety of munitions for personnel and ordnance in all kinds of situations is important. One of the major threats for munitions is heating of munitions (cook-off), direct (fire) as well as indirect heating (fire in adjacent room). In this study the time to cook-off for several munitions items has been investigated by means of simple 1-dimensional calculations. These calculations have been performed on in-service munitions items, from 35 mm up to 155 mm, with fillings as HMX, RDX and TNT or a combination of this. Also research has been carried out on gun propellants in general. From these results, guidelines

have been given to improve the regulations for fire fighting as written in MP 40-21 'Voorschrift voor opslag van gevaarlijke stoffen' or the 'Brandweeropleiding Brandmeester'.

DTIC

*Ammunition; Explosions; Fires; Firing (Igniting); Heating*

**20080002630** Jackson and Tull, Inc., Edwards AFB, CA USA

**Thermographic Characterization and Comparison of 200W and 600W Hall Thruster (Postprint)**

Matlock, Taylor S; Hargus, William A; Larson, C W; May 23, 2007; 22 pp.; In English

Contract(s)/Grant(s): Proj-2308

Report No.(s): AD-A473814; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Thermal analysis of Hall thrusters is necessary for both performance optimization and spacecraft integration. The thermal characteristics of the thruster influence the lifetime, energy losses, and spacecraft integration. The lifetime of most Hall thrusters is limited by the erosion of the insulating materials within the discharge chamber, which may vary with temperature. Thruster thermal data are also indicative of thruster energy losses as well as the heating characteristics of spacecraft interface surfaces. The results of the thermographic imaging of two laboratory Hall thrusters, a 200W (BusekBHT-200-X3) and 600W (BusekBHT-600), are presented. Surface temperature profiles were obtained using an infrared camera (7-13 microns), independently verified by thermocouples. Infrared imagery of thruster start-up, steady-state, and shut-down was recorded and used to approximate the transient heating behavior of each thruster. Variation of the nominal mass flow rate (resulting in proportional variation of the anode current and power level) between 85% to 115% resulted in proportional changes to the thruster surface temperatures.

DTIC

*Hall Thrusters; Thermography*

80

**SOCIAL AND INFORMATION SCIENCES (GENERAL)**

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

**20080000773** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Educating and Inspiring Young People for the Next Generation of Exploration**

Armstrong, Robert C., Jr.; September 18, 2007; 23 pp.; In English; AIAA Space 2007, 18-20 Sep. 2007, Long Beach, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000773>

With the graying of the nation's scientific workforce and the decline in students pursuing science, technological, engineering, and math related-studies, real challenges lie ahead if America is to continue to sustain the Vision for Space Exploration in the foreseeable future. Likewise, challenges exist in the economic arena as the USA seeks to maintain its preeminence among the technological leaders of the world. Currently, less than 6 percent of high school seniors are pursuing engineering degrees, down from 36 percent a decade ago. Today, China produces six times as many engineers as does the USA and Japan, at half our population, develops twice as many engineers. Despite spending more per capita on public education than any other nation, except Switzerland, U.S. students of high school age are failing to compete with many foreign countries. These trends do not bode well for America's future competitiveness in space and other technically driven areas, such as defense.

Author

*Engineers; Schools; Students; United States; Age Factor; Education*

## DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

**20080000367** Department of Defense, Arlington, VA USA

**Air Force Network-Centric Solutions Contract**

Jun 29, 2007; 52 pp.; In English

Report No.(s): AD-A472157; D-2007-106; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472157>

**Who Should Read This Report and Why?** This report should be read by all who are responsible for and involved in the implementation and execution of indefinite-delivery, indefinite-quantity contracts. The report addresses contracting, information assurance, small business, and oversight issues that require management attention to ensure Government contracts are sufficiently planned and implemented. **Background.** This report is the first in a series of reports concerning the Air Force Network-Centric Solutions (NETCENTS) contract. The Air Force NETCENTS contract is a multiple-award, indefinite-delivery, indefinite-quantity product, service, and total solutions contract. It has a \$9 billion order ceiling and a base contract term of 3 years with two 1-year options. The contract provides the Air Force, DoD, and other Federal agencies a primary source of networking equipment and system engineering, installation, integration, operations, and maintenance. We initiated this audit based on a request from the Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer to determine whether the Air Force NETCENTS contract contained the required contracting and information assurance requirements. The Air Force Chief Information Office issued an action memorandum stating the Air Force is required to use the NETCENTS contract for all networking and information technology products and service requirements.

DTIC

*Data Processing; Systems Engineering*

**20080000385** Department of Defense, Arlington, VA USA

**Army Information Technology Enterprise Solutions-2 Services Contract**

Jolliffe, Richard B; Burton, Bruce A; Wiccarver, Jacqueline L; Davis, Sean A; Dekle, Charles S; Burger, Michael T; Niranjana, Frank; Phan, Tam; Bachle, Susan H; McLaurin, Adam J; Aug 9, 2007; 63 pp.; In English

Contract(s)/Grant(s): Proj-D2006-D000AS-0173.000

Report No.(s): AD-A472193; IG/DOD-D-2007-115; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472193>

Contracting personnel from the Army and other Federal agencies who are involved in information technology service acquisition decisions should read this report because it provides an assessment of how the Army can improve small business participation in indefinite-delivery, indefinite-quantity (IDIQ) contracts. The Inspector General (IG), DoD initiated the audit of the Army Information Technology Enterprise Solutions-2 Services (ITES-2S) contract because of the material impact this contract will have on the acquisition of information technology resources within DoD and the Federal Government. The ITES-2S contract has a ceiling price of \$20 billion, a 3-year base period, and three 2-year option periods. The purpose of the ITES-2S contract is to support the Army enterprise infrastructure and infostructure goals with information technology services worldwide. The U.S. Army, DoD, and all other Federal agencies will be authorized to fulfill requirements under the ITES-2S contract. The Army Information Technology, E-Commerce, and Commercial Contracting Center contracting officials did not justify consolidating contract requirements for the ITES-2S contract. Also, the officials selected an inappropriate North American Industry Classification System (NAICS) code in the solicitation of the contract. As a result, ITES-2S is a bundled contract that improperly restricted small business competition and was unsuitable for small business award. Bundling a contract without justification violates U.S. Code and Federal regulations. The Army Contracting Agency internal controls were not adequate. The IG identified material internal control weaknesses on the adherence of the ITES-2S contract NAICS code to the Federal Acquisition Regulation requirements. The IG requested that the Assistant Secretary of the Army for Acquisition, Logistics, and Technology halt all ITES-2S contracting activity and future task orders until after the problems identified in this report are resolved.

DTIC

*Commerce; Contract Management; Government Procurement; Information Systems*

**20080000437** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

**Energy-Efficient Querying of Wireless Sensor Networks**

Mann, Christopher R; Sep 2007; 212 pp.; In English

Report No.(s): AD-A472292; AFIT/DS/ENG/07-19; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472292>

Due to the distributed nature of information collection in wireless sensor networks and the inherent limitations of the component devices, the ability to store, locate, and retrieve data and services with minimum energy expenditure is a critical network function. Additionally, effective search protocols must scale efficiently and consume a minimum of network energy and memory reserves. A novel search protocol, the Trajectory-based Selective Broadcast Query protocol, is proposed. An analytical model of the protocol is derived, and an optimization model is formulated. Based on the results of analysis and simulation, the protocol is shown to reduce the expected total network energy expenditure by 45.5 percent to 75 percent compared to current methods. This research also derives an enhanced analytical node model of random walk search protocols for networks with limited-lifetime resources and time-constrained queries. An optimization program is developed to minimize the expected total energy expenditure while simultaneously ensuring the proportion of failed queries does not exceed a specified threshold. Finally, the ability of the analytical node model to predict the performance of random walk search protocols in large-population networks is established through extensive simulation experiments. It is shown that the model provides a reliable estimate of optimum search algorithm parameters.

DTIC

*Information Systems; Wireless Communication*

**20080000440** California State Univ., Long Beach, CA USA

**Strategic Mobility 21: Development of Joint Data Standards and Communication Protocols in An Integration Tracking System**

Mallon, Lawrence G; Chen, Andrew; Aug 31, 2007; 61 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-C-0060

Report No.(s): AD-A472295; CR-0009; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472295>

The Integrated Tracking System (ITS) supports the flow of freight to and from the Southern California Logistics Airport (SCLA) and will be integrated with the Inland Port-Multi-Modal Terminal Operating System. The ITS design integrates Contract Line Item Numbers (CLIN) 0009 Joint Data Standard and Communications Protocol, CLIN 0010 the Regional Wireless Network Design, and CLIN 0012 the Regional IT Data Network. This project CLIN 0009 is to build a Data Center to support all Information Technology requirements from the ITS and eventually the Joint Deployment and Distribution Support Platform (JDDSP). The design work includes configuring secure data capture and integration networks, creating the information interfacing layer, and establishing the web interface. The algorithm platform is on the basis of Web 2.0 which is featuring Wireless, RFID, Ontology, Unified Modeling Language (UML), Metadata, and XML.

DTIC

*Communication Networks; Data Transmission; Deployment; Information Systems; Logistics; Mobility; Protocol (Computers); Systems Integration*

**20080000564** Embassy of Canada, Washington, DC USA

**TTCP and CD&E. NATO Symposium on Analytical Support to Defence Information**

Schmitke, Rod; Apr 28, 2005; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Conferences; Military Technology; North Atlantic Treaty Organization (NATO); Research and Development*

**20080000594** Library of Congress, Washington, DC USA

**Balancing Scientific Publication and National Security Concerns: Issues for Congress**

Shea, Dana A; Jan 10, 2003; 31 pp.; In English

Report No.(s): AD-A472372; CRS-RL31695; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The federal government has historically supported the open publication of federally funded research results. In cases where such results presented a challenge to national security concerns, several mechanisms have been employed. For the results of fundamental research, the federal policy has been to use classification to limit its dissemination. For advanced

technology and technological information, a combination of classification, export, and arms trafficking regulation is used to inhibit its spread. The terrorist attacks of 2001 have increased scrutiny of nonconventional weapons, including weapons of mass destruction, and a series of research publications, including results showing that polio virus could be artificially created, have increased concerns over whether publication of federally funded extramural research results could threaten national security. The current federal policy, as described in National Security Decision Directive 189, is that fundamental research should remain unrestricted and that, in the rare case where it is necessary to restrict such information, classification is the appropriate vehicle to do so. Other mechanisms restrict information flow on the international level, where Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR) control the export of items and technical information on specific lists. Both the EAR and ITAR contain an exclusion for fundamental research, but this exclusion is lost if prepublication review of research results for sensitive information occurs.

DTIC

*Balancing; Security*

**2008000605** Human Effectiveness Directorate, Wright-Patterson AFB, OH USA

**Development of an Integrated Toxicity Assessment System for use in Operational Deployment and Materials Development**

Geiss, Kevin T; May 2006; 12 pp.; In English

Contract(s)/Grant(s): Proj-1710

Report No.(s): AD-A472404; AFRL-HE-WP-TR-2006-0039; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rapid assessment of chemical hazards and potential toxicity are serious concerns for the modern battle field commander before and following deployment. Whether it is considered during the design and development of a weapon system, or in the fielding of that system, the effects of chemicals used in operational setting have the potential to cause mission degradation, morbidity and mortality. In addition to NBC concerns, there are issues in many current military settings for exposures to toxic industrial chemicals or materials (TICs or TIMs). Significant health issues caused by use of legacy chemicals have emphasized the need for more effective predication of chemical toxicity. This paper discusses issues relating to toxicity predictions and the development of an integrated computational system for the assessment of chemical toxicity. The system design is comprised of a series of modules each dedicated to addressing specific areas of concern, e.g. exposure scenarios and chemical property predictions. The integrated toxicity assessment system (ITAS) is serving as a model for other industrial applications.

DTIC

*Chemical Composition; Deployment; Hazards; Information Systems; Systems Integration; Toxic Hazards; Toxicity*

**2008000772** NASA Glenn Research Center, Cleveland, OH, USA

**A Database of Supercooled Large Droplet Ice Accretions**

Multimedia Database

VanZante, Judith Foss; September 2007; In English; SAE and Engine Icing International Conference: A Database of Supercooled Large Droplet Ice Accretions, 24-27 Sep. 2007, Seville, Spain

Contract(s)/Grant(s): NCC06BA07B; WBS 122711.03.11.04.04.01

Report No.(s): NASA/CR-2007-215020/SUPPL; SAE-2007-01-3348; E-16222; No Copyright; Avail.: CASI: C01, CD-ROM

A unique, publicly available database regarding supercooled large droplet (SLD) ice accretions has been developed in NASA Glenn's Icing Research Tunnel. Identical cloud and flight conditions were generated for five different airfoil models. The models chosen represent a variety of aircraft types from the horizontal stabilizer of a large transport aircraft to the wings of regional, business, and general aviation aircraft. In addition to the standard documentation methods of 2D ice shape tracing and imagery, ice mass measurements were also taken. This database will also be used to validate and verify the extension of the ice accretion code, LEWICE, into the SLD realm.

Author

*Data Bases; Drop Size; Ice Formation; Supercooling; Wind Tunnels*

**2008000779** Wood (Bob) Aerospace Consulting Services, Inc., Tullahoma, TN, USA

**Space Environmental Effects Knowledgebase**

Wood, B. E.; June 2007; 56 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS8-02029N; NRA8-31

Report No.(s): NASA/CR-2007-214961; M-1190; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000779>

This report describes the results of an NRA funded program entitled Space Environmental Effects Knowledgebase that received funding through a NASA NRA (NRA8-31) and was monitored by personnel in the NASA Space Environmental Effects (SEE) Program. The NASA Project number was 02029. The Satellite Contamination and Materials Outgassing Knowledgebase (SCMOK) was created as a part of the earlier NRA8-20. One of the previous tasks and part of the previously developed Knowledgebase was to accumulate data from facilities using QCMs to measure the outgassing data for satellite materials. The main object of this current program was to increase the number of material outgassing datasets from 250 up to approximately 500. As a part of this effort, a round-robin series of materials outgassing measurements program was also executed that allowed comparison of the results for the same materials tested in 10 different test facilities. Other programs tasks included obtaining datasets or information packages for 1) optical effects of contaminants on optical surfaces, thermal radiators, and sensor systems and 2) space environmental effects data and incorporating these data into the already existing NASA/SEE Knowledgebase.

Author

*Outgassing; Spacecraft Contamination; Spacecraft Construction Materials; Aerospace Environments; Quartz Crystals; Microbalances; Information Systems*

**2008000780** NASA Marshall Space Flight Center, Huntsville, AL, USA

**FY 2005 Scientific and Technical Reports, Articles, Papers, and Presentations**

Narmore, K. A., Compiler; June 2007; 84 pp.; In English

Report No.(s): NASA/TM-2007-214963; M-1192; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080000780>

This Technical Memorandum (TM) presents formal NASA technical reports, papers published in technical journals, and presentations by Marshall Space Flight Center (MSFC) personnel in FY 2005. It also includes papers of MSFC contractors. The information in this TM may be of value to the scientific and engineering community in determining what information has been published and what is available.

Author

*Bibliographies; Research and Development; Aerospace Engineering; NASA Programs*

**2008000800** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Navy Acquisition Executive's Management Oversight and Procurement Authority Category I and II Programs**

Mar 9, 2007; 103 pp.; In English

Report No.(s): AD-A472298; ODIGAD-D-2007-066; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Civil service and military personnel involved in the management oversight and procurement authority for Navy acquisition programs should read this report. It discusses program management oversight issues that the Navy should address to improve how acquisition officials manage and acquire weapon systems. This is the third in a series of reports that discusses the Service Acquisition Executives management oversight and procurement authority for Acquisition Category IC and II programs. This report discusses the management oversight and procurement authority within the Navy. Two other reports discussed the management oversight and procurement authority within the Army and Air Force. We initiated this audit due to congressional and DoD interest in whether milestone decision authorities and procurement officials for the Services were complying with statutory and regulatory requirements in the DoD acquisition process. We evaluated the adequacy of the Navy Acquisition Executive (NAE) management oversight and procurement authority by reviewing 13 Acquisition Category IC and II programs with a total estimated research and development cost of \$6.170 billion and a total estimated procurement cost of \$28.244 billion in FY 2006 dollars. The Assistant Secretary of the Navy (Research, Development, and Acquisition) is the milestone decision authority for the development and procurement of Navy Acquisition Category IC and II programs. The Navy uses a database called Dashboard to help manage the Navy programs.

DTIC

*Acquisition; Management Planning; Navy; Personnel; Procurement*

**2008000807** Army Engineer Research and Development Center, Vicksburg, MS USA

**Evaluation of Airborne Remote Sensing Techniques for Predicting the Distribution of Energetic Compounds on Impact Areas**

Graves, Mark R; Dove, Linda P; Jenkins, Thomas F; Bigl, Susan; Walsh, Marianne E; Hewitt, Alan D; Lambert, Dennis; Perron, Nancy; Ramsey, Charles; Gamey, Jeff; Beard, Les; Doll, William E; Magoun, Dale; Aug 2007; 202 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472264; ERDC-TR-07-13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472264>

The characterization of impact area munitions constituents has typically employed traditional soil sampling approaches. These sampling approaches do not accurately account for the distribution of such contaminants over the landscape due to the distributed nature of explosive compound sources throughout impact areas, the highly localized distribution of contaminants surrounding these sources, and inaccurate records of historical target locations. Remote sensing and geographic information system (GIS) technologies were utilized to assist in the development of enhanced sampling strategies to better predict the landscape-scale distribution of energetic compounds. Remotely sensed magnetometer and electromagnetic (EM) data were used to detect and delineate areas of high densities of anomalies. The anomalies were considered to be related to targets and/or ranges likely to be highly contaminated with surface and subsurface ordnance and explosive items and artifacts. The Oak Ridge Airborne Geophysical System airborne magnetometer and time-domain EM systems were used. The magnetometer data were analyzed using GIS technology to develop a soil sampling plan based on varying levels of metal content in the ground. Soil samples were then collected and analyzed for energetic compounds. Statistical techniques found that a possible relationship (correlation) between analytic signal and the energetics measured in the soil may exist.

DTIC

*Aerial Reconnaissance; Contaminants; Detection; Explosives; Geographic Information Systems; Predictions; Remote Sensing*

**2008000808** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**The Effects of Hurricane Katrina on the Defense Information Systems Agency Continuity of Operations and Test Facility**

Jolliffe, Richard B; Burton, Bruce A; Wiccarver, Jacqueline L; Kince-Carnpbell, Therese M; Lesly, Kelly B; Ryan, Susan P; Pinnock, Richard A; Bachle, Susan H; Calderon, Pedro J; Voshell, Adrienne R; Johnson, Meredith H; Dec 12, 2006; 30 pp.; In English

Report No.(s): AD-A472322; ODIGAD-D-2007-031; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This audit report is the second in a planned series of audits on the effects of Hurricane Katrina on DoD information technology resources. The first report, DoD Inspector General Report No. D-2007-006, 'Hurricane Katrina Disaster Recovery Efforts Related to Army Information Technology Resources,' October 19, 2006, discussed the effects of Hurricane Katrina on Army information technology resources operated by the 321st Theater Materiel Management Center. The Defense Information Systems Agency Continuity of Operations and Test Facility (DCTF), located in Slidell, Louisiana, experienced communications disruptions as a result of Hurricane Katrina. DCTF provides information technology services that consist of integrated environments for product evaluation; technology; functional, developmental, performance, and information assurance testing; operational assessments and demonstrations; and knowledge management. Federal policy requires all systems to have a contingency plan to ensure that service support continues through disruptions. In addition, DoD Directive 3020.26, 'Defense Continuity Program,' September 8, 2004, requires DoD Components to have a comprehensive and effective continuity program that ensures DoD Component mission-essential functions continue under all circumstances. The Directive also requires DoD Components to develop, coordinate, and maintain continuity plans; to update and reissue plans every 2 years; and to test and exercise continuity plans at least annually, or as otherwise directed.

DTIC

*Hurricanes; Information Systems; Resources Management; Test Facilities*

**2008000920** RAND Corp., Santa Monica, CA USA

**Byting Back. Regaining Information Superiority Against 21st-Century Insurgents**

Libicki, Martin C; Gompert, David C; Frelinger, David R; Smith, Raymond; Jan 2007; 192 pp.; In English

Contract(s)/Grant(s): W74V8H-06-C-0002

Report No.(s): AD-A472417; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Armed conflict has always made serious demands on information, whether it is about the disposition of our own forces or the intentions and status of the adversaryps. With the advent of modern information systems, the management of information about friend and foe has become a key determinant of how armed conflict plays out. The Department of Defense's (DoD's)



information architecture for conventional warfare reflects that fact. Counterinsurgency, though, differs from conventional warfare. First, whereas the battles in conventional warfare are waged between dedicated armed forces, the battles of counterinsurgency are waged for and among the people, the central prize in counterinsurgency. Collecting information about the population is much more important than it is in conventional warfare. Second, the community that conducts counterinsurgency crosses national and institutional boundaries. institutional boundaries. U.S. and indigenous forces must work together. So, too, must military forces, security forces(notably police), and providers of other governmental services. Sharing information across these lines, thus, has a greater importance than in conventional warfare. An integrated counterinsurgency operating network (ICON) should, therefore, be different than that which DoD has built for conventional warfare. In this monograph, we outline the principles and salient features of ICON.

DTIC

*Information Systems; Information Management; Systems Management*

**20080000950** Bae Systems Advanced Information Technologies, Inc., Burlington, MA USA

**I2AT: The Information and Interpretation Analysis Toolkit**

Hunter, Dan; Melhuish, James; Seidel, Andy; Tierno, Jorge; Sep 2007; 58 pp.; In English; Original contains color illustrations  
Contract(s)/Grant(s): FA8750-05-C-0221; Proj-459E

Report No.(s): AD-A472357; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472357>

BAE Advanced Information Technologies (AIT) has developed an Information Interpretation and Analysis Toolkit (I2AT) that provides a set of analytic capabilities that fit within and augment a knowledge management system. The I2AT tool will address the challenge of effectively analyzing vast amounts of information with limited analyst manpower by focusing analyst attention on available pieces of information that produce significant changes in the assessment of the situation and identifying additional information that has the potential to do so. The central capabilities of the I2AT are as follows: interpretation, false information detection, and data needs generation. The I2AT software uses Bayesian Networks, a probabilistic modeling framework, augmented with a suite of algorithms for analyzing hypotheses, data, and value of additional information. Automated generation of potential interpretations will help reduce the time needed to assimilate and act on new information. At the same time, flagging new data that is inconsistent with existing information will identify potential errors in the knowledge acquisition process or adversary attempts at deception, enabling preemptive correction before erroneous interpretations precipitate actions. I2AT implements an error model for information sources into the Bayesian Network that allows it to reason about the correctness of particular reports and what new evidence would best resolve ambiguities. Within a knowledge management framework, data that are tagged as potentially deceptive can be tracked to determine what analytic results need to be called into question. Finally, I2AT will be able to determine which additional information would have the greatest potential to explain observed inconsistencies.

DTIC

*Bayes Theorem; Data Processing; Deception; Detection; Error Analysis; Information Analysis; Knowledge Based Systems; Software Development Tools*

**20080000954** Naval Postgraduate School, Monterey, CA USA

**Extending Comprehensive Maritime Awareness to Disconnected Vessels and Users**

Clarke, Lynne; Chang, Toufue; Roderick, Andrea; Reel, Walter; Alvarez, Kimberly; Kennedy, Galen; Ritchey, Robert; Le, Cop; Sep 2007; 171 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472532; NPS-SE-07-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472532>

After the attacks of 9/11, increasing security became a national priority that has grown steadily since that date. National Maritime Security is one area of focus that has expanded into several new programs. Maritime Domain Awareness (MDA) is an initiative developed by the Coast Guard, in partnership with the U.S. Navy and other agencies to increase awareness in the maritime domain in support of maritime security. The purpose of MDA is to generate actionable intelligence obtained via the collection, fusion and dissemination of information from U.S. joint forces, U.S. government agencies, international coalition partners and commercial entities. This actionable intelligence is the cornerstone of successful counterterrorist and maritime law enforcement operations and is critical to Maritime Security. The U.S. Navy, as a partner in the development and creation of MDA, has tasked its subordinate commands to identify and define capabilities to support this program. One effort sponsored is the Comprehensive Maritime Awareness (CMA) Joint Capabilities Technology Demonstration (JCTD). This project supports the CMA JCTD efforts by proposing a deployable system to enable a disconnected vessel to connect to the CMA network. A disconnected user is seen as a merchant ship, hospital ship or any vessel not currently connected to the CMA

network. This project's proposed deployable system facilitates information sharing for disconnected vessels in support of humanitarian efforts worldwide.

DTIC

*Information Transfer; Military Operations; Security*

**2008000967** Carnegie-Mellon Univ., Pittsburgh, PA USA

**Governing for Enterprise Security (GES) Implementation Guide**

Westby, Jody R; Allen, Julia H; Aug 2007; 116 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A472572; CMU/SEI-2007-TN-020; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472572>

Governing for enterprise security means viewing adequate security as a non-negotiable requirement of being in business. If an organization's management does not establish and reinforce the business need for effective enterprise security, the organization's desired state of security will not be articulated, achieved, or sustained. To achieve a sustainable capability, organizations must make enterprise security the responsibility of leaders at a governance level, not of other organizational roles that lack the authority, accountability, and resources to act and enforce compliance. This implementation guide builds upon prior publications by providing prescriptive guidance for creating and sustaining an enterprise security governance program. It is geared for senior leaders, including those who serve on boards of directors or the equivalent. Throughout the implementation guide, we describe the elements of an enterprise security program (ESP) and suggest how leaders can oversee, direct, and control it, and thereby exercise appropriate governance. Elevating security to a governance-level concern fosters attentive, security-conscious leaders who are better positioned to protect an organization's digital assets, operations, market position, and reputation. This document presents a roadmap and practical guidance that will help business leaders implement an effective security governance program.

DTIC

*Management Planning; Security*

**2008001060** Naval Research Lab., Washington, DC USA

**Evolutionary Algorithm Based Automated Reverse Engineering and Defect Discovery**

Smith, III, James F; Sep 21, 2007; 35 pp.; In English

Report No.(s): AD-A472759; NRL/FR/5740--07-10; 155; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472759>

A data mining based procedure for automated reverse engineering and defect discovery has been developed. The data mining algorithm for reverse engineering uses a genetic program (GP) as a data mining function. A GP is an evolutionary algorithm that automatically evolves populations of computer programs or mathematical expressions, eventually selecting one that is optimal in the sense that it maximizes a fitness function. The system to be reverse engineered is typically a subcomponent of a sensor that may not be disassembled and for which there are no design documents. The sensor is used to create a database of input signals and output measurements. Rules about the likely design properties of the sensor are collected from experts. The rules are used to create a fitness function for the GP, allowing GP-based data mining. This procedure incorporates not only the experts' rules into the fitness function, but also the information in the database. The information extracted through this process is the internal design specifications of the sensor. These design properties can be used to create a fitness function for a genetic algorithm (GA), which is in turn used to search for defects in the digital logic (DL) design. In this report, design flaws in two different sensor systems are detected using a GA. One of these systems makes passive detections, the other makes up part of a radar. In the second case, detecting the flaw allows the design of a radar jamming signal. Uncertainty related to the input-output database and the expert-based rule set can significantly alter the reverse engineering results. This report provides significant experimental and theoretical results related to GP-based data mining for reverse engineering. It presents methods of quantifying uncertainty. Finally, it examines methods for reducing the uncertainty.

DTIC

*Algorithms; Defects; Information Retrieval; Reverse Engineering*

**20080001212** Defence Research and Development Canada, Toronto, Ontario Canada

**CommandView User Interface Evaluation: Preliminary Heuristic Analysis Results**

Hollands, J G; Mar 2006; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472960; DRDC-T-TM-2006-039; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document presents a preliminary heuristic evaluation of the CommandView user interface in use at the National Defence Command Centre. The analysis is based on Nielsen's Heuristics. In general, CommandView displays key information for the Joint staff in a comprehensive, integrated format. However, key problems involve consistency of organization. A solution may be to provide a consistent interface by providing standardized terminology across sites and dynamic control of content. A proper evaluation study involving multiple evaluators and/or usability testing is recommended to generate more representative and reliable results and generate further guidance for improvements.

DTIC

*Heuristic Methods; Human-Computer Interface; Information Systems; User Requirements*

**20080001214** Humansystems, Inc., Guelph, Ontario Canada

**Decision Making Styles: Classification System, Contextual Analysis and Validation of Classification System**

Martin, L B; Bandali, F; Lamoureux, T; Mar 2006; 39 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7711-047911/001/TOR

Report No.(s): AD-A472965; DRDC-CR-2006-063; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Joint Command Decision Support for the 21st Century Technology Demonstration (JCDS 21 TD) project investigates individual and organizational factors, as well as technology, with respect to decision making. As part of the JCDS 21 TD work plan, it is necessary to gain an understanding of current scientific research on human decision making, individual differences, and the potential to identify consistent individual preferences for specific decision making styles. Research has indicated that a variety of individual factors affect the way in which people make decisions. In addition, individual strategies can be more or less suited to different kinds of task domains. Thus, it is important to develop an understanding of the individual differences in decision making strategies or approaches. This work seeks to identify separate decision strategies within an organized categorization scheme that is based on empirical research. This framework will serve as the basis for exploring the individual factors that predict the use of given strategies as well as the consistency with which individuals favor any given strategy. The ultimate aim of this work was the development of a survey tool that could be used to classify the kinds of decision strategies consistently adopted by an individual. The work represents follow-on work from a literature survey in which a review was conducted of current scientific literature relevant to decision making styles and person-based, social/group, and situation/context factors that may affect one's preference for specific decision making styles. The report describes a contextual analysis of tasks performed by the JSTAFF with respect to decision-making styles, the development of a decision-making styles classification system, and an experimental validation methodology that can be used to evaluate the decision-making styles classification system.

DTIC

*Classifications; Decision Making; Systems Analysis*

**20080001253** Office of the Deputy under Secretary of Defense (Industrial Affairs and Installations), Washington, DC USA

**Market Research Gathering Information About Commercial Products and Services**

Jul 1997; 62 pp.; In English

Report No.(s): AD-A473042; ODUSD-SD-5; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DoD 5000.2-R, Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs, requires that market research and analysis be conducted to determine the availability and suitability of commercial and nondevelopmental items prior to the commencement of any development effort, during the development effort, and prior to the preparation of any product description. Part 10 of the Federal Acquisition Regulation prescribes policies and procedures for conducting market research to arrive at the most suitable approach to acquiring, distributing, and supporting supplies and services. This handbook is intended to complement DoD 5000.2-R and Part 10 of the Federal Acquisition Regulation by providing general guidance, tools, and examples to assist you in conducting market research for a wide variety of items and services.

DTIC

*Handbooks; Market Research*

**20080001473** Valcom Consulting Group, Inc., Halifax, Nova Scotia Canada

**Literature Survey on Operator Performance using Multiple Displays**

Donne, Vincenzo D; Mar 2006; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W7707=05-2970

Report No.(s): AD-A473054; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A survey has been completed to investigate literature in the area of operator performance using multiple displays, in order to support a variety of projects in the Maritime Command, Control, Communications, Computer and Intelligence (C4I) environment at Defence Research and Development Canada (DRDC) Atlantic. Using a defined set of keywords and literature sources, various documents, reports, papers and articles were found, of which 100 were assessed according to a set of criteria that identified those that were more useful for adaptation to the present project's goals and objectives. Of the literature identified in the survey, 7 were reviewed in detail and summarized.

DTIC

*Display Devices; Operator Performance; Surveys*

**20080001482** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Information Technology Management: Select Controls for the Information Security of the Ground-Based Midcourse Defense Communications Network**

Truex, Kathryn M; Lamar, Karen J; Leighton, George A; Woodruff, Courtney E; Brunetti, Tina N; Russell, Dawn M; Feb 24, 2006; 43 pp.; In English

Report No.(s): AD-A472629; ODIGAD-D-2006-053; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472629>

The Director and Chief Information Officer, Missile Defense Agency, and other Missile Defense Agency managers responsible for making operational and information assurance-related decisions pertaining to the Ground-Based Midcourse Defense Communications Network should read this report to reduce the risk of interruption, misuse, modification, and unauthorized access to information in the system. Additionally, all DoD Component Chief Information Officers with oversight responsibilities for contractor-owned or operated systems should read this report. This report is one in a series on operational control reviews at the Missile Defense Agency. In May 2003, the President directed DoD to field an initial set of missile defense capabilities and begin operating them in 2004 and 2005. In recent years, more countries are developing sophisticated missiles that are capable of reaching the USA. Ballistic missile defense is a challenging mission because of the speed and altitude of a ballistic missile. In late 2004, the USA fielded the initial Ballistic Missile Defense System that can be used for limited defense operations. The Ballistic Missile Defense System is comprised of various elements to include the Ground-Based Midcourse Defense system, which is contractor-owned and operated. The system includes infrastructure, sensors, radars, and interceptors, which are connected by the Ground-Based Midcourse Defense Communications Network. This network provides connectivity for all system components to transfer and process information to operators performing engagement activities.

DTIC

*Communication Networks; Information Systems; Security*

**20080001489** Office of the Secretary of Defense, Washington, DC USA

**DoD Technology Transfer and Transition Opportunities**

Gonsalves, Cynthia E; Jul 6, 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472573; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472573>

These slides accompanied the keynote speech by the Acting Director, Office of Technology Transition given to the Department of Defense (DoD)/Navy Technology Development Opportunities Seminar. The seminar was design to introduce small technology businesses to DoD programs that foster the invention and improvement of military relevant technologies and to programs such as the Technology Transfer Initiative (TTI) that seek to accelerate technology commercialization of DoD research through such mechanisms as patent license agreements and government/private partnerships.

DTIC

*Military Technology; Technology Transfer*

**20080001644** Minnesota Univ., Minneapolis, MN USA

**Spatial Databases**

Gandhi, Vijay; Kang, James; Shekhar, Shashi; Sep 19, 2007; 48 pp.; In English

Report No.(s): AD-A473104; TR-07-020; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473104>

Spatial database research has continued to advance greatly since three decades ago, addressing the growing data management and analysis needs of spatial applications. This research has produced a taxonomy of models for space, conceptual models, spatial query languages and query processing, spatial file organization and indexes, and spatial data mining. However, emerging needs for spatial database systems include the handling of 3D spatial data, temporal dimension with spatial data, and spatial data visualization. In addition, the rise of new systems such as sensor networks and multi-core processors is likely to have an impact in spatial databases. The goal of this paper is to provide a broad overview of the recent advancements in spatial databases and research needs in each area.

DTIC

*Data Bases; Data Management*

**20080001652** Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD USA

**U.S. Army Toxic and Hazardous Materials Agency Chain-of-Custody Procedures**

Jul 1985; 11 pp.; In English

Report No.(s): AD-A473115; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473115>

No abstract available

*Computer Storage Devices; Data Storage; Hazardous Materials; Records Management; Toxicity*

**20080001694** Space and Naval Warfare Systems Command, San Diego, CA USA

**Software Support Activity Information Technology Update Newsletter**

Hardy, D R; Casciola, G; Park, J; Duffy, L; MacCrossen, J; Lowe, P; Brimson, D; Snee, B; Milligan, D; Reuben, D; Jun 2006; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473203; SPAWAR-D-3215; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473203>

This periodical provides a collection of articles written by the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) Software Support Activity (SSA) as a consistent method of communicating SSA efforts and vision, while providing awareness of key enterprise challenges. The JPEO-CBD is managed by the Space and Naval Warfare Systems Center San Diego and is directed by the Space and Naval Warfare Systems Command. The SSA is a team composed of government and contractor agencies that provide enterprise support in the key tenets of net-centric operations to U.S. Department of Defense chemical and biological programs.

DTIC

*Computer Programming; Information Systems; Interoperability; Software Engineering*

**20080001830** Army Cold Regions Research and Engineering Lab., Hanover, NH USA

**In Situ California Bearing Ration Database**

Seman, Peter M; Shoop, Sally A; Oct 2007; 97 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-GWRVA00472412

Report No.(s): AD-A473240; ERDC/CRREL-TR-07-21; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A global database of in situ soil test measurements and associated attributes was compiled for use in developing California bearing ratio (CBR) prediction models. From a variety of potential data sources, a collection of U.S. Army and Air Force airfield pavement research and evaluation reports was selected for inclusion. The schema includes data fields for common geotechnical parameters related to airfield pavement strength and geomorphological features associated with soil formation. More than 4,500 records from 46 test sites, representing 10 countries and 4 continents, were gathered and more than 1,500 of these contain field CBR test values. The database includes a wide variety of Unified Soil Classification System (USCS) soil types from a diversity of natural environments. The distribution of the numeric parameters in the database fall within the range of published distributions for natural soils reported in the literature.

DTIC

*Data Bases; Landing Sites; Rations; Soils; Surveys*

**20080001844** Naval Academy, Annapolis, MD USA

**Exploring Dimensionality Reduction for Text Mining**

Underhill, David G; May 4, 2007; 119 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473266; USNA-TSPR-362; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Text mining is the extraction of important information from a collection of textual data sources. For instance, text mining can be used to discover related concepts or to categorize previously unseen documents. In this age of information overload, text mining applications can potentially yield tremendous benefits to both individuals and organizations. However, the effectiveness of text mining is limited by the large volume of textual data, as well as its complex and noisy characteristics. Both of these challenges can be addressed with 'dimensionality reduction' (DR). DR is the process of transforming a large amount of data into a much smaller, less noisy representation that preserves important relationships from the original data. DR techniques have been shown to effectively simplify large geometric datasets, but have yet to be adequately evaluated for textual data. This project evaluated five DR techniques (Principal Components Analysis, Multidimensional Scaling, Isomap, Locally Linear Embedding, and Laplace-Beltrami Diffusion Maps) from two distinct perspectives. First, the impact of each DR technique on the ability to automatically perform document classification on corpuses of scientific abstracts or news articles was measured. For each technique, the dataset was reduced, then a standard linear, quadratic, or nearest neighbor classifier was used to assign categories to a test set of documents based upon a labeled training set. Results showed that, for any fixed number of dimensions used by the classifier, performing any kind of DR almost always improved classification accuracy compared to using the non-reduced data. Amongst different DR techniques, Isomap and Multi-dimensional Scaling were best able to reduce the data and eliminate noise, yielding improved accuracy. This suggests that these textual data sets lie primarily on a linear manifold for which the more complex non-linear techniques do not have an advantage.

DTIC

*Classifications; Data Processing; Information Retrieval; Texts*

**20080001863** Aptima, Inc., Washington , DC USA

**Measuring, Monitoring, and Managing Knowledge in Command and Control Organizations**

Freeman, Jared; Weil, Shawn A; Hess, Kathleen P; Jun 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473303; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

*Command and Control; Decision Making; Information Management; Organizations; Symbols*

**20080001924** Naval Postgraduate School, Monterey, CA USA

**Mining Data from the Army Reserve for Analysis of Attrition Factors**

Radtke, Jr, Robert D; Jun 2007; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473380; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this thesis was to analyze the impact of increased utilization and deployments of Troop Program Unit soldiers since 9/11, countered against the effects of demographics and of the programs and actions meant to control attrition. This study conducted a process of data collection, data manipulation, and data-mining algorithms executed against the entire enlisted TPU population and focused toward attrition behavior. Significant factors in determining attrition behavior included time in service, increased bonus levels and the Delayed Entry Program. Mobilizations, in and of themselves, appear to have little impact. The models we built showed significant potential for predicting behavior. We believe that this process should be continued and expanded to a tool to aid in and affect attrition.

DTIC

*Data Mining; Information Retrieval; Military Personnel; Reserves*

**20080001952** Rand Arroyo Center, Santa Monica, CA USA

**The Knowledge Matrix Approach to Intelligence Fusion**

Pernin, Christopher; Moore, Louis; Comanor, Katherine; Jan 2007; 56 pp.; In English

Contract(s)/Grant(s): W74V8H-06-C-0001

Report No.(s): AD-A473459; RAND/TR-416-A; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As the U.S. military transforms to an information-based force, it will need processes and methods to collect, combine, and utilize the intelligence that is generated by its assets. The process known as fusion will play an important role in determining whether this intelligence is used in the most beneficial manner. The process of fusion, combining pieces of information to produce higher-quality information, knowledge, and understanding, is often poorly represented in constructive

models and simulations that are used to analyze intelligence issues. This report describes one approach to capturing the fusion process in a constructive simulation, providing detailed examples to aid in further development and instantiation. The sequential fusion method is intended to determine whether separate intelligence observations are close enough geographically, have consistently identified the same battlefield entity, and contain high-quality information, all of which must be considered before fusion of intelligence can occur. The fusion process described in this report is, for the most part, an implicit representation of the generation of battlefield intelligence and can be used in a constructive simulation or fusion model to better understand the dynamics of intelligence-gathering systems and their effect on intelligence metrics.

DTIC

*Computer Programs; Information Management; Intelligence; Vision*

**20080001953** RAND Corp., Santa Monica, CA USA

**Network Technologies for Networked Terrorists: Assessing the Value of Information and Communication Technologies to Modern Terrorist Organizations**

Don, Bruce; Frelinger, Dave; Gerwehr, Scott; Landree, Eric; Jackson, Brian; Jan 2007; 103 pp.; In English

Contract(s)/Grant(s): W81XWH-05-F-0191

Report No.(s): AD-A473460; RAND/TR-454-DHS; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Understanding how terrorists conduct successful operations is critical to countering them. Terrorist organizations use a wide range of network technologies as they plan and stage attacks. This book explores the role that these communications and computer technologies play and the net effect of their use, the purpose and manner in which the technology is used, the operational actions of terrorists and possible responses of security forces. The authors conclude that future network technologies modestly improve terrorist group efficiency, particularly for their supporting activities, but do not dramatically improve their attack operations. Precluding terrorists from getting the technology they want is impractical; developing direct counters is unlikely to yield high payoffs. Instead, exploiting the technologies and the information such technologies use to enable more direct security force operations are more promising options.

DTIC

*Computer Networks; Information; Organizations; Telecommunication; Terrorism*

**20080001954** RAND Corp., Santa Monica, CA USA

**Using Probabilistic Terrorism Risk Modeling for Regulatory Benefit-Cost Analysis. Application to the Western Hemisphere Travel Initiative Implemented in the Land Environment**

Latourrette, Tom; Willis, Henry H; May 2007; 62 pp.; In English

Report No.(s): AD-A473461; RAND/WR-487-IEC; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Intelligence Reform and Terrorism Prevention Act of 2004 requires that the Secretary of Homeland Security develop a plan for reliably evaluating the identity and citizenship of people entering the U.S. In response, the U.S. Customs and Border Protection 'CBP' and U.S. Department of State are proposing a regulation specifying documentation requirements for people entering the U.S. via land borders from countries in the Western Hemisphere, referred to as the Western Hemisphere Travel Initiative 'WHTI-L'. The White House Office of Management and Budget directs agencies to use benefit-cost analyses to evaluate proposed regulations during the regulatory review process. However, data and methods for estimating the benefits of terrorism security regulations like the WHTI-L are inadequate to support benefit-cost analysis. This report introduces a framework for using probabilistic terrorism risk modeling in a break-even analysis of a regulatory action, demonstrates an application of the framework on the regulatory analysis of WHTI-L, and discusses how this type of analysis can be further integrated into the regulatory review process.

DTIC

*Cost Effectiveness; Risk; Security; Terrorism; Western Hemisphere*

**20080002139** Office of the Deputy Inspector General for Auditing, Arlington, VA USA

**Special Army Reports Prepared by Defense Finance and Accounting Service Indianapolis Operations**

Granetto, Paul J; Marsh, Patricia A; Armstrong, Jack L; Wenzel, Paul C; Barnes, Leslie M; Grum, Andrew D; Kleiman, E E; Baer, Joseph A; Maroska, Chad A; Thompson, Ann L; Apr 27, 2007; 31 pp.; In English

Report No.(s): AD-A473166; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473166>

Army and Army personnel responsible for preparing and using special Army reports should read this report. This is the second in a series of reports related to Army budget execution operations. The first report discussed the transmission of Army

budget execution data by the Defense Finance and Accounting Service (DFAS) Indianapolis Operations to various accounting systems and the Department of the Treasury. This report discusses special Army reports prepared by DFAS Indianapolis Operations. Background. DFAS Indianapolis Operations provides finance and accounting support to the Army and Defense agencies. This support includes preparation of 14 recurring special Army reports that provide financial and other information to DFAS customers. The special Army reports are either requested by the report user or are required by regulation and cover areas such as: proceeds and expenses associated with agriculture, grazing, and forestry; receivables for Army and Defense; and foreign currency and unit exchange information. DFAS Indianapolis Operations prepares the special Army reports based on budget execution data and data call information submitted DoD field accounting activities and other sources. Results. Of the 14 special Army reports we reviewed, 5 were incorrect, 1 was unnecessary, and 1 report had no known users. As a result, recipients of special Army reports were not receiving the information they needed and DFAS Indianapolis Operations was not using resources effectively. DFAS Indianapolis Operations management controls were not effective to ensure correct preparation of special Army reports. The Director of DFAS Indianapolis Operations should revise the standard operating procedures to ensure that special Army reports are accurate, supervisors review and approve the reports, and unneeded reports are not prepared.

DTIC

*Accounting; Accuracy; Costs*

**20080002196** Office of Naval Research, Arlington, VA USA

**Literature-Related Discovery (LRD)**

Kostoff, Ronald N; Block, Joel A; Solka, Jeffrey L; Briggs, Michael B; Rushenberg, Robert L; Stump, Jesse A; Johnson, Dustin; Lyons, Terence J; Wyatt, Jeffrey R; Nov 1, 2007; 884 pp.; In English

Report No.(s): AD-A473438; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Discovery in science is the generation of novel, interesting, plausible, and intelligible knowledge about the objects of study. Literature-related discovery (LRD) is the linking of two or more literature concepts that have heretofore not been linked (i.e., disjoint), in order to produce novel interesting, plausible, and intelligible knowledge (i.e., potential discovery).

DTIC

*Information Retrieval; Data Acquisition; Research and Development*

**20080002200** Cornell Univ., Ithaca, NY USA

**AFRL/Cornell Information Assurance Institute**

Schneider, Fred; Mar 2007; 67 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0170; F49620-02-1-0170

Report No.(s): AD-A473335; CU-41467; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The AFRL/Cornell Information Assurance Institute supported a broad spectrum of research aimed at developing a science and technology base to enhance information assurance and networked information systems trustworthiness-system and network security, reliability, and assurance. Moreover, the institute also fostered closer collaborations between Cornell and AFRL researchers, as well as facilitating technology transfer and exposing Cornell researchers to problems facing the Air Force.

DTIC

*Data Management; Information Systems*

**20080002385** Naval Medical Research Inst., San Diego, CA USA

**Case Study: The Transformation of the Health Record; The Impact of Electronic Medical Records in a Military Treatment Facility**

Verhulst, Daren A; Jun 2006; 81 pp.; In English

Report No.(s): AD-A473555; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473555>

This research project utilized the qualitative case study method to describe the process, problems, and results of the implementation of the electronic medical record in a large military medical center from the medical record department's perspective. Much has been written on the need for an electronic medical record to improve efficiency and safety in patient care. However, there is minimal information on actual implementation processes and their outcomes. This project benchmarked the medical records department and provides a summary of how it did business before the electronic medical record, , and chronicled the transformation that occurred with the implementation of the electronic medical record. The



research question for this study was 'how will the transformation of the health record from paper to electrons impact the medical records administration in a large military medical center?'

DTIC

*Health; Records Management*

**20080002387** Darnall Army Hospital, Fort Hood, TX USA

**Emergency Preparedness: An Analysis of Staff Knowledge and Training at Darnall Army Community Hospital, Fort Hood, Texas**

Hayes, James H; May 2006; 55 pp.; In English

Report No.(s): AD-A473560; AMDCS-15-06; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473560>

Currently Army hospitals receive guidance and standards for the establishment and maintenance of an emergency management plan (EMP) from multiple entities, including the USA Army Medical Command (MEDCOM), the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), and the National Fire Protection Agency (NFPA). These organizations require the establishment of an EMP, yet mechanisms to measure its effectiveness are not provided. JCAHO accreditation is often cited as an indicator of effectiveness, yet it is merely an indicator of compliance with performance measures. Compliance does not tell the hospital or its stakeholders whether or not the staff is adequately trained on the emergency management plans and if they can effectively execute the plan as written. Survey results show that approximately 90 percent of the staff indicated they were in need of additional training and almost 50 percent indicated the most beneficial training would be section level training/drills/exercises that focused on individual section specific responsibilities.

DTIC

*Education; Emergencies; Hospitals; Information Management; Management Methods*

**20080002411** Office of Naval Research, Arlington, VA USA

**The Seminal Literature of Anthrax Research**

Kostoff, Ronald N; Morse, Stephen A; Oncu, Serkan; May 2007; 13 pp.; In English

Report No.(s): AD-A473602; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473602>

A chronically weak area in research papers, reports, and reviews is the complete identification of seminal background documents that formed the building blocks for these papers. A method for systematically determining these seminal references is presented. Citation-Assisted Background (CAB) is based on the assumption that seminal documents tend to be highly cited. Application of CAB to the field of Anthrax research is presented. While CAB is a highly systematic approach for identifying seminal references, it is not a substitute for the judgment of the researchers, and serves as a supplement.

DTIC

*Infectious Diseases; Information Retrieval*

**20080002431** Office of Naval Research, Arlington, VA USA

**Text Mining the Biomedical Literature**

Kostoff, Ronald N; Nov 5, 2007; 381 pp.; In English

Report No.(s): AD-A473638; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473638>

Text mining of the biomedical literature provides patterns of relationships among concepts, people, and institutions, offering enhanced medical/technical intelligence unobtainable by other means. This report describes myriad text mining capabilities. Section 1 covers biomedical knowledge management, the role of text mining in knowledge management, and describes the cultural changes and global agreements required to allow the full power and capabilities of text mining to be utilized. The next two sections address information retrieval issues. Section 2 describes the extraction of useful information from the published biomedical literature. Section 3 describes the information content in different record fields in a major medical database. The next four sections address computational linguistics issues, especially related to identifying patterns and relationships in text. Section 4 outlines a family of methods for generating radical biomedical discovery from the literature. Section 5 shows how increasing specialization within the biomedical community creates roadblocks for the acceleration of radical discovery, and recommends ways to eliminate these roadblocks. Section 6 describes the detection of unexpected asymmetries from the biomedical literature, with a specific example on bilateral organ cancer incidence asymmetry detection. Section 7 describes a unique approach for removing words/phrases of low technical content and improving the quality of the

resulting technical taxonomies. Section 8 describes the use and misuse of citation analysis in biomedical text mining. Section 9 describes citation mining. Section 10 describes the use of citation analysis to evaluate the quality of research performers. Section 11 shows a systematic approach for defining the seminal literature of any biomedical topic. Sections 12 and 13 describe the differences between highly and poorly cited biomedical articles, with specific case studies from leading medical journals.

DTIC

*Artificial Intelligence; Biomedical Data; Information Management; Information Retrieval; Linguistics; Medical Science; Natural Language Processing*

**20080002432** Office of Naval Research, Arlington, VA USA

#### **Literature-Related Discovery: A Review**

Kostoff, Ronald N; Block, Joel A; Solka, Jeffrey L; Briggs, Michael B; Rushenberg, Robert L; Stump, Jesse A; Johnson, Dustin; Lyons, Terence J; Wyatt, Jeffrey R; Nov 5, 2007; 59 pp.; In English

Report No.(s): AD-A473643; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473643>

Discovery in science is the generation of novel, interesting, plausible, and intelligible knowledge about the objects of study. Literature-related discovery (LRD) is the linking of two or more literature concepts that have heretofore not been linked to produce novel interesting, plausible, and intelligible knowledge (i.e., potential discovery). Two major variants of LRD are open discovery systems (ODS), where one starts with a problem and generates a potential solution (or vice versa), and closed discovery systems (CDS), where one starts with a problem and a potential solution and generates linking mechanisms. This report reviews the state-of-the-art in ODS LRD only. It examines the major LRD concepts, evaluates each concept in detail from the perspective of discovery capability, and examines the level of potential 'discovery' reported in the literature from each concept's implementation. In the evaluation of potential discovery claimed in the published literature, a vetting process is used that requires that both characteristics of ODS LRD are present for potential discovery to be affirmed: concepts are linked that have not been linked previously, and novel, interesting, plausible, and intelligible knowledge is produced. The major conclusions are that, until recently, most of the reported ODS LRD techniques had not generated discovery, and this lack of discovery had hampered the growth of ODS LRD substantially. However, ODS LRD techniques have been developed that allow significantly greater amounts of potential discovery to be generated systematically.

DTIC

*Artificial Intelligence; Biomedical Data; Information Retrieval; Medical Science*

**20080002441** Executive Office of the President, Washington, DC USA

#### **National Strategy for Information Sharing: Successes and Challenges in Improving Terrorism-Related Information Sharing**

Oct 2007; 48 pp.; In English

Report No.(s): AD-A473664; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473664>

Our success in preventing future terrorist attacks depends upon our ability to gather, analyze, and share information and intelligence regarding those who want to attack us, the tactics that they use, and the targets that they intend to attack. Improving information sharing in the post-September 11 world requires an environment that supports the sharing of information across all levels of government, disciplines, and security domains. While this Strategy describes the vision that has guided the Administration for the past six years, it also sets forth our plan to build upon progress and establish a more integrated information sharing capability to ensure that those who need information to protect our Nation from terrorism will receive it and those who have that information will share it. We will improve interagency information sharing at the Federal level, while building information sharing bridges between the Federal Government and our non-Federal partners. The National Strategy for Information Sharing takes its lead from the President's National Security Strategy, which provides the broad vision and goals for confronting the national security challenges of the 21st century. In addition, it is closely aligned with the National Strategy for Combating Terrorism and the National Strategy for Homeland Security. This Strategy also supports and supplements the National Implementation Plan, which is the foundational document guiding the efforts of the Directorate of Strategic Operational Planning in the National Counterterrorism Center. Finally, this Strategy aligns with the National Intelligence Strategy, published at Presidential direction by the Director of National Intelligence in October 2005. An information sharing framework is recognized as a critical component of intelligence reform in the National Intelligence Strategy.

DTIC

*Intelligence; Policies; Security; Terrorism*

**20080002627** Naval Postgraduate School, Monterey, CA USA

**Business Process Reengineering with Information Technology at the Marine Corps Basic School**

Brauer, Brian J; Sep 2007; 73 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473805; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis analyzed the principles and concepts of The Marine Corps Basic School (TBS) at the operational level and the current Information Management Systems used to track the progress of new officers. A web-enabled prototype for TBS was developed to optimize management and decision support for deliberate, time sensitive planning utilized to optimize student performance. The first iteration of the prototype was tested by the TBS Testing Officer. The results of this research revealed potential benefits for student leadership, academic, and tactical tracking. This prototype will be used as a tool for requirements gathering as TBS develops Marine Corps Enterprise Training Information Management System.

DTIC

*Commerce; Decision Support Systems; Information Systems; Schools*

**20080002669** Naval Postgraduate School, Monterey, CA USA

**The Case for a Knowledge Based DoD Software Enterprise: An Exploratory Study Using System Dynamics**

Dixon, Jr, Richard J; Sep 2007; 77 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473892; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research project will examine the DoD Software Acquisition process utilizing Jay Forrester's System Dynamics methodology. Well known acquisition issues and policies will be examined with specific focus on oversight, process integration, process discipline, and knowledge management. These issues will be examined for causality and dependent relationships. Additionally, a proof of concept systems dynamics model will be developed to simulate the system and test possible interventions for organizational structure and policy.

DTIC

*Computer Programs; Defense Program; Knowledge Based Systems*

**20080002671** Naval Postgraduate School, Monterey, CA USA

**The Combined Enterprise Regional Information Exchange System -- The Way Ahead**

Cook, Douglas A; Lancaster, Jr , Patrick E; Patto, Jr, Robert R; Sep 2007; 155 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473894; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Combined Enterprise Regional Information Exchange System (CENTRIXS) is a coordinated Department of Defense Program established at the request of the Combatant Commands (COCOMs) to support the Global War on Terrorism (GWOT). CENTRIXS is a standing, global enterprise network allowing U.S. and coalition nations and their forces, in a seamless manner, to securely share operational and intelligence information in support of combined planning, unity of effort, and decision making in multinational operations. This thesis describes CENTRIXS networks that support the needs of the COCOMs on a global basis. The document also addresses who is connected to whom, what kinds of information must be passed from one user to another, and the services provided to the users of CENTRIXS networks. The authors conduct a Knowledge Value Added analysis to streamline the manning and usability of CENTRIXS nodes. They also explore how to efficiently and effectively go through the process of acquisition, installation, and accreditation of a CENTRIXS node.

DTIC

*Communication Networks; Information Systems; Military Operations; Optimization*

**20080002878** Library of Congress, Washington, DC USA

**Books in Action: Armed Services Editions**

Cole, John Y; Jan 1984; 85 pp.; In English

Report No.(s): AD-A473543; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473543>

The Armed Services Editions introduced thousands of American soldiers and sailors to the pleasures of reading. Between 1943 and 1947, nearly 123 million copies of 1,322 titles of these flat, wide, and very pocketable paperbacks were distributed to U.S. Armed Forces around the world. Best-sellers, classics, mysteries, history, westerns, and poetry were part of each shipment. For most of the U.S. troops overseas, Armed Services Editions were the only books that were easily available. And never had so many books found so many enthusiastic readers. How did it happen? The idea of producing low-cost books for overseas distribution originated in 1942 in the U.S. Army. Ray L. Trautman, a young officer who headed the army Library

Section, developed the scheme with assistance from H. Stahley Thompson, a U.S. Army graphic arts specialist. A key part of the plan was to use rotary presses normally used for printing magazines but available during wartime for other purposes because of the drop in the production of consumer goods. But nothing on a large scale could be accomplished unless American publishers would accept the plan and allow current books to be reprinted. In January 1943, Trautman and Thompson took their proposal to Malcolm Johnson of D. Van Nostrand Company, who was a member of the executive committee of the Council on Books in Wartime. The council was the catalyst that turned a good idea from the U.S. Army into an efficient cooperative enterprise which involved the army, the navy, the War Production Board, over seventy publishing firms, and more than a dozen printing houses, composition firms, and paper suppliers. The Council on Books in Wartime was a group of trade book publishers, librarians, and booksellers formed in 1942 to use books to contribute 'to the war effort of the United Peoples.'

DTIC

*Military Personnel; Handbooks; Armed Forces (United States)*

**20080002895** Naval Postgraduate School, Monterey, CA USA

**Misuse Case Driven Development of Secure Information Sharing for Coalition Environment**

Baek, Seung S; Sep 2007; 82 pp.; In English; Original contains color illustrations

Report No.(s): AD-A473704; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Sharing information among communities can result in more informed decisions being made faster. Information sharing involves the flow of unclassified and classified information, and consequently should be carefully engineered to avoid flow-based mistakes such as creating covert channels inadvertently. This thesis uses misuse cases to identify such misuses of a sharing system. We show that an appropriate distributed role-based access control model imposed upon information brokers can prevent enumerate misuse cases. We use the North Korean nuclear proliferation as a case study to elucidate our claims.

DTIC

*Security; Information Transfer; Information Flow; Distributed Parameter Systems; Active Control*

85

**TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION**

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety*, *16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

**20080002254** National Defense Univ., Norfolk, VA USA

**Joint Improvised Explosive Device Defeat Organization (JIEDDO): Tactical Successes Mired in Organizational Chaos; Roadblock in the Counter-IED Fight**

Ellis, Richard F; Rogers, Richard D; Cochran, Bryan M; Mar 13, 2007; 20 pp.; In English

Report No.(s): AD-A473109; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473109>

The USA Department of Defense (DoD) estimates that Improvised Explosive Devices (IEDs) are responsible for almost 50% of the casualties (both mortal and injured) sustained in Iraq and nearly 30% of those sustained in Afghanistan since the start of combat operations. Furthermore, in Operation Iraqi Freedom (OIF) and Iraqi Enduring Freedom (OEF), deaths from IEDs have steadily increased since the cessation of major combat operations in 2003. As a result of the staggering losses inflicted by these devices, defeating this terrorist tactic has become a top priority for the DoD. The American public is swayed by many things, but none more convincingly than nightly news reports of U.S. casualties from IEDs in Iraq and Afghanistan. To win the Global War On Terrorism (GWOT), bureaucrats and warriors alike must harness the nation's ingenuity and resources to defeat this terrorist weapon, which threatens to diminish national will in the fight for freedom. Given the magnitude of the IED threat, the Secretary of Defense created the Joint IED Defeat Organization (JIEDDO) to address this problem in February, 2006. JIEDDO is chartered to 'focus' (lead, advocate, coordinate) all DoD actions in support of the Combatant Commanders' and their respective Joint Task Forces' efforts to defeat IEDs as weapons of strategic influence. However, JIEDDO, as an organization, possesses neither the structure nor the authority to effectively prosecute the war against IEDs. As a large, bureaucratic organization rooted in the technological approach to defeating IEDs, JIEDDO lacks the agility to quickly react to a changing enemy and has no legal authority to compel other DoD entities to act. This paper analyzes

JIEDDO by reviewing its origins, examining its current structure and authority, and identifying recommendations that may improve its ability to defeat IEDs.

DTIC

*Chaos; Countermeasures; Explosive Devices; Explosives; Military Operations*

88

## SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

**20080000342** NASA Johnson Space Center, Houston, TX, USA

### **Cleaning Genesis Solar Wind Collectors with Ultrapure Water: Residual Contaminant Particle Analysis**

Allton, J. H.; Wentworth, S. J.; Rodriguez, M. C.; Calaway, M. J.; January 2008; 2 pp.; In English; Lunar and Planetary Sciences Conference, 12-16 Mar. 2007, Houston, TX, USA; Original contains black and white illustrations; Copyright;

Avail.: CASI: [A01](#), Hardcopy

Additional experience has been gained in removing contaminant particles from the surface of Genesis solar wind collectors fragments by using megasonically activated ultrapure water (UPW)[1]. The curatorial facility has cleaned six of the eight array collector material types to date: silicon (Si), sapphire (SAP), silicon-on-sapphire (SOS), diamond-like carbon-on-silicon (DOS), gold-on-sapphire (AuOS), and germanium (Ge). Here we make estimates of cleaning effectiveness using image analysis of particle size distributions and an SEM/EDS reconnaissance of particle chemistry on the surface of UPW-cleaned silicon fragments (Fig. 1). Other particle removal techniques are reported by [2] and initial assessment of molecular film removal is reported by [3].

Derived from text

*Solar Wind; Cleaning; Contaminants; Accumulators; Image Analysis; Silicon; Carbon; Fragments; Water; Germanium*

**20080000617** Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

### **Use of Two-Way Time Transfer Measurements to Improve Geostationary Satellite Navigation**

Dainty, Benjamin G; Mar 2007; 131 pp.; In English; Original contains color illustrations

Report No.(s): AD-A472457; AFIT/GSS/ENG/07-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An emerging use of GPS is to provide accurate navigation information for satellites in orbit. The GPS satellites are designed to provide service to terrestrial users, so the antenna array points directly towards the Earth and uses a narrow primary beamwidth. Because GEO altitudes are well above the GPS constellation, the Earth occludes most of the GPS signals to the satellite. Decreased satellite visibility is debilitating, as GPS navigation requires at least four visible satellites to determine position. To assist with the visibility problem, the receiver can look at the GPS satellite transmit antenna side lobes, but this does not entirely solve the navigation problem. GPS measurements are inherently bound by receiver clock errors. The clock error must be known or estimated in order to obtain meaningful ranging information. To obtain three-dimensional positioning, at least four satellites must be tracked to solve for three dimensions of position plus the receiver clock error. A new method for improving geostationary navigation accuracy using GPS is to correct the time error by including Two-Way Time Transfer (TWTT) measurements. TWTT is a technique in which signals are simultaneously exchanged between two clocks, and is one of the most accurate methods of comparing clocks. By effectively removing the clock error between the GPS satellite and the GPS receiver, TWTT allows meaningful information to be gathered when less than four GPS satellites are available. The results show a 21-38% improvement in the 3-D RMS position accuracy while using TWTT between the GEO satellite and an atomic clock on the ground. There was a 60-70% improvement when the clock on the ground was synchronized to GPS time.

DTIC

*Artificial Satellites; Geosynchronous Orbits; Global Positioning System; Navigation; Radio Receivers; Synchronous Platforms; Time Measurement*

89  
**ASTRONOMY**

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

**2008000771** NASA Goddard Space Flight Center, Greenbelt, MD, USA

**What can be Learned from X-ray Spectroscopy Concerning Hot Gas in Local Bubble and Charge Exchange Processes?**

Snowden, Steve; [2007]; 5 pp.; In English; From the Outer Heliosphere to the Local Bubble: Comparisons of New Observations with Theory, 1-19 Oct. 2007, Bern, Switzerland; Original contains black and white illustrations; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/2008000771>

What can be learned from x-ray spectroscopy in observing hot gas in local bubble and charge exchange processes depends on spectral resolution, instrumental grasp, instrumental energy band, signal-to-noise, field of view, angular resolution and observatory location. Early attempts at x-ray spectroscopy include ROSAT; more recently, astronomers have used diffuse x-ray spectrometers, XMM Newton, sounding rocket calorimeters, and Suzaku. Future observations are expected with calorimeters on the Spectrum Roentgen Gamma mission, and the Solar Wind Charge Exchange (SWCX). The Geospheric SWCX may provide remote sensing of the solar wind and magnetosheath and remote observations of solar CMEs moving outward from the sun.

CASI

*Calorimeters; High Temperature Gases; Magnetosheath; Remote Sensing; Sun; X Ray Spectrometers; X Ray Spectroscopy; Bubbles*

**20080001244** Naval Observatory, Washington, DC USA

**The Fifth Data Release of the Sloan Digital Sky Survey**

Hennessy, Gregory S; Oct 2007; 12 pp.; In English

Report No.(s): AD-A473030; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the Fifth Data Release (DR5) of the Sloan Digital Sky Survey (SDSS). DR5 includes all survey quality data taken through 2005 June and represents the completion of the SDSS-I project (whose successor, SDSS-II, will continue through mid-2008). It includes five-band photometric data for 217 million objects selected over 8000 deg squared and 1,048,960 spectra of galaxies, quasars, and stars selected from 5713 deg squared of that imaging data. These numbers represent a roughly 20% increment over those of the Fourth Data Release; all the data from previous data releases are included in the present release. In addition to 'standard' SDSS observations, DR5 includes repeat scans of the southern equatorial stripe, imaging scans across M31 and the core of the Perseus Cluster of galaxies, and the first spectroscopic data from SEGUE, a survey to explore the kinematics and chemical evolution of the Galaxy. The catalog database incorporates several new features, including photometric redshifts of galaxies, tables of matched objects in overlap regions of the imaging survey, and tools that allow precise computations of survey geometry for statistical investigations.

DTIC

*Astronomy; Astrophysics; Images; Sky Surveys (Astronomy); Surveys*

**20080001594** Gemini Observatory, Hilo, HI, USA

**Gemini Focus: Newsletter of the Gemini Observatory**

Michaud, Peter, Editor; Fisher, Scott, Editor; Peterson, Carolyn Collins, Editor; June 2007; 60 pp.; In English; See also 20080001595 - 20080001604; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Topics include: New Instrumentation for Gemini Telescopes; Science of Seeing: An International Symposium; New Views of Neptune; 0-18 & Origin of Two Types of Rare Carbon Stars; Tightening the (Asteroid) Belt Around Zeta Leporis; Flows and Jets in HII Regions; Understanding Gamma-ray Bursts; The Delicate Trails of Starbirth; Rapid Target of Opportunity Mode; and Gemini's Dataflow Project.

Derived from text

*Neptune (Planet); Gamma Ray Bursts; Asteroid Belts; H II Regions; Carbon Stars*

**20080001595** Gemini Observatory, Hilo, HI, USA

**New Instrumentation for Gemini Telescopes**

Jensen, Joseph; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 6-13; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

To produce forefront science and continue to compete in the global marketplace of astronomy, Gemini Observatory must

constantly update its instrument suite. A new generation of instruments is now nearing completion. The Near-Infrared Coronagraphic Imager (NICI) was recently delivered to Gemini South, and the near-infrared multi-object spectrograph FLAMINGOS-2 should arrive at Cerro Pachon later this year. Gemini staff members are integrating the Multi-Conjugate Adaptive Optics (MCAO) system in Chile now, and the Gemini South Adaptive Optics Imager (GSAOI) is already there, waiting to sample the exquisite images MCAO will deliver. At Gemini North, the visiting mid-infrared echelle spectrograph TEXES will join the Gemini collection again for a few weeks in semester 2007B as a guest instrument. The new instruments, along with the existing collection of facility instruments, will propel Gemini towards the lofty science goals outlined in Aspen, Colorado nearly four years ago. Gemini is now beginning construction of the next generation of instrumentation that will help answer ~rofound questions about the universe and our place in it. Many of these questions relate directly to the formation of planets, their physical characteristics, and their prevalence. Others address the most fundamental questions about the nature of the matter (baryonic and dark) and dark energy that make up the universe. Two of the new Aspen instruments-the Gemini Planet Imager, (GPI), and the Precision Radial Velocity Spectrometer, (PRVS)-have been designed explicitly to find and study extrasolar planets. The Wide-field Fiber Multi-Object Spectrometer (WF MOS) will provide a revolutionary new capability to study the formation and evolution of the Milky Way Galaxy and millions of others like it, reaching back to the earliest times of galaxy formation. WF MOS will also shed light on the mysterious dark energy that is responsible for the accelerating expansion of the universe, counteracting the force of gravity on the largest scales. Finally the Ground-Layer Adaptive Optics (GLAO) capability being explored for Gemini North will improve our vision across a large enough field of view to explore the first luminous objects in the universe, along with practically everything else as well.

Derived from text

*Observatories; Coronagraphs; Spectrographs; Telescopes; Adaptive Optics; Spectrometers*

**20080001596** Gemini Observatory, Hilo, HI, USA

#### **0-18 & Origin of Two Types of Rare Carbon Stars**

Geballe, Thomas R.; Clayton, Geoffrey; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 18-21; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

Sometimes the path to an important scientific discovery has a totally unexpected beginning. In our case the beginning was an e-mail on November 10, 2004, &om one of us (GCC) to the other (TRG). It asked for assistance in identifying some absorption features in an unpublished infrared spectrum obtained a few years earlier at Steward Observatory in Arizona, of a hydrogen-deficient carbon (HdC) star, one of a class of stars so obscure that only five members are known. The identification of these features and subsequent followup observational studies at Gemini South, together with theoretical modeling by our collaborators, Martin Asplund, Falk Herwig, and Chris Fryer, appear to be spurring a leap in understanding the origins of these five stars. In addition, they also help us understand a somewhat more populous, much more famous, and apparently closely related class of star that the two of us had been studying together for several years, the R Coronae Borealis (RCB) stars. The infrared spectrum in question was of HD 137613, a cool HdC star. Carbon stars are so named because they contain more carbon than oxygen. Each of the five stars in this class has a large overabundance of carbon and almost no hydrogen. The infrared spectrum of HD 137613, like that of most cool stars, showed strong overtone bands of the most common isotopic species of carbon monoxide,  $^{12}\text{C}^{16}\text{O}$ . But it also showed a second set of equally strong absorption bands offset in wavelength from those of  $^{12}\text{C}^{16}\text{O}$ . In many evolved stars the bands of the next most abundant isotopic species of carbon monoxide is  $^{13}\text{C}^{16}\text{O}$  and are also present at somewhat lower strength. However, the wavelengths of the second set of bands in HD 137613 did not match those of  $^{13}\text{C}^{16}\text{O}$ . In fact, no  $^{13}\text{C}^{16}\text{O}$  was apparent.

Derived from text

*Carbon Stars; Oxygen; Infrared Spectra; Absorption Spectra; Cool Stars; R Coronae Borealis Stars*

**20080001597** Florida Univ., FL, USA

#### **Tightening the (Asteroid) Belt Around Zeta Leporis**

Moerchen, Margaret; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 22-24; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

While all stars initially possess a primordial dust disk as a byproduct of collapse &om a molecular cloud, most of this material is blown out by the newly formed star within the first few million years of its life. Therefore, if large amounts of dust are observed around stars older than this, the dust must have a more recent source of replenishment. Before the primordial material escapes, there may be time for planetary bodies to form, and it is from these objects-&om collisions of rocky bodies and the evaporation of comets passing near the star-that dust is regenerated. Once the reprocessed dust is released into the so-called debris disk, its presence is involuntarily battled by its host star. The smallest particles, less than a micron in diameter, are pushed out of the system by radiation pressure almost immediately. Larger particles are consumed by the star after spiraling

in under the effect of Poynting-Robertson drag, a process that occurs over a slightly longer timescale, perhaps hundreds or thousands of years. As these dust particles travel inward, they are likely to experience further collisions that break them up into ever-smaller particles that are then blown out in a process known as a collisional cascade. If we detect substantial amounts of dust around a star, then we can likely infer that the dust production processes are either essentially ongoing or very recent. Debris disks are not rare. To date, there are over a hundred candidates derived from photometric measurements. However, only about a dozen have ever been spatially resolved at any wavelength. The advent of large ground-based telescopes such as Gemini has provided an excellent opportunity to pursue unresolved candidate sources in and on to probe the disk structure and investigate the physical processes occurring within them. The observations of the archetypal disk around the star Beta Pictoris, which suggest the recent occurrence of a cataclysmic collision, provide a superb example of this capability. More recently, we have uncovered what may be a new archetype in the disk around the star Zeta Leporis.

Derived from text

*Asteroid Belts; Molecular Clouds; Collisions; Dust; By-Products; Radiation Pressure; Replenishment*

**20080001598** Gemini Observatory, Hilo, HI, USA

### **Rapid Target of Opportunity Mode**

Roth, Katherine; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 35-36; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

The Target of Opportunity (ToO) mode at Gemini Observatory enables observations of astronomical phenomena whose exact timing and/or location cannot be predicted, but which can be anticipated to occur at some time in the near future. Historically, ToO observations have been initiated at telescopes through various channels, such as phone calls requesting favors of classical observers, or official requests for Director's Discretionary (DD) time made to observatory directors. Generally, the turnaround intervals (from detection of the interesting event to acquisition of the scientific data) for ToOs requested through these manual channels have varied from about an hour to several days. Gemini Observatory supports requests for DD observations, but also offers two formal ToO modes (Rapid and Standard) which are requested when an investigator submits a proposal during the Phase I process. The Rapid ToO mode is intended to allow observations to commence as soon as possible after an investigator decides that an astronomical event meeting the program criteria has occurred. The goal is for a Rapid ToO spectroscopic observation to commence within 15 minutes of the trigger being received at Gemini, with significantly shorter response times for imaging since no acquisition is required.

Derived from text

*Astronomical Observatories; Infrared Telescopes; Solar System; Gemini Project*

**20080001599** Texas Univ., Austin, TX, USA

### **Flows and Jets in H II Regions**

Lacy, John; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 25-27; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

Newly formed massive stars can have much more dramatic effects on their surroundings than stars like the Sun do. Stars with masses greater than twenty times the Sun's, known as O-type stars, are hot enough to emit ultraviolet radiation that ionizes surrounding gas, forming prominent H II regions (heated hydrogen gas clouds). The best-known example of a H II region is the Orion Nebula, M42, where gas ionized by the Trapezium stars glows brightly enough to be visible to the naked eye. These bright stars must have formed inside of the Orion Molecular Cloud a few million years ago. They ionized and heated the gas around them, which then expanded and broke out of the cloud because of the high pressure of the hot gas. When the H II region was still inside the cloud, it would have been a compact or ultracompact H II region, with high enough density to be very bright at radio and infrared wavelengths, although hidden in the visible. After the H II region broke out of the cloud, it became visible. However, the gas continued to expand as it continued to expand as it flowed away from the cloud, causing its surface to gradually decrease as a result.

Derived from text

*Massive Stars; Hydrogen Clouds; High Temperature Gases; H II Regions; Gas Ionization; Ionized Gases*

**20080001600** Gemini Observatory, Hilo, HI, USA

### **Gemini's Dataflow Project**

Crabtree, Dennis; Hirst, Paul; Labrie, Kathleen; Gillies, Kim; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 42-45; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

Previous generations of telescopes focused on reliably producing quality raw data for their observers. The observers



would typically take the data home on magnetic tape, reduce it (or have graduate students reduce it), analyze it, and produce a publication. They may even have written their own software to do the data reduction. The availability of data reduction packages such as IRAF, or tool boxes such as IDL, reduced the burden of data reduction, but the observer still needed to reduce the data. The Space Telescope Science Institute (STScI) advanced this process for data from the Hubble Space Telescope (HST) by producing reduced data for their users utilizing automated reduction pipelines. Not only did STScI deliver reduced data to people, they also made the processing software available so investigators could tweak the reduction or use more current calibration files to improve the quality of the data reduction. Numerous other observatories, including many groundbased facilities, now make reduced data available to their science community. While in some cases the processing may not be intended to be science-quality, or may be limited to a subset of instruments or observing modes, it is entirely possible that we could create a system to automatically reduce Gemini data in such a way as to reduce the effort needed by our users (or their graduate students) to extract science results from their data. The availability of pipeline-reduced data from HST and other telescopes has whetted researchers' appetites for automatically reduced data. Science that once took months of toil now may be only a few mouse clicks away.

Derived from text

*Spaceborne Telescopes; Data Processing; Data Reduction; Magnetic Tapes; Calibrating; Hubble Space Telescope*

**20080001601** Space Science Inst., Boulder, CO, USA

### **New Views of Neptune**

Hammel, Heidi B.; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 14-17; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

In the atmosphere of Neptune, methane is the most abundant constituent after molecular hydrogen and helium. Its photolysis (decomposition under the influence of light) near the microbar pressure level produces a variety of hydrocarbons, including ethane. Together, methane and ethane emission dominate the planet's spectrum from 7 to 13 microns. Neptune's mid-infrared ethane emission strength has increased markedly over the past two decades, which has been interpreted as resulting from a steady rise in stratospheric temperature. The planet's reflectivity at visible wavelengths has also steadily increased over the same time period, reaching its brightest level in nearly 30 years of photometric monitoring in 2003. Physical correlation between these two long-term changes could indicate increased hydrocarbon creation at upper altitudes, with implications for the dynamical and transport properties of the upper troposphere and lower stratosphere. The planet has exhibited significant atmospheric activity throughout this time at both visible and near-infrared wavelengths. Such activity is attributed to variability of methane-condensate cloud brightnesses and distributions. To determine if a link exists between the variation seen at mid-infrared wavelengths and the deeper clouds observed in the visible and near infrared, we used the Gemini and Keck telescopes to obtain nearly simultaneous mid-infrared and near-infrared imaging in July 2005. Given that the disk of the planet subtends 2.3 arcseconds in the sky, large telescopes are needed to provide high enough spatial resolution to study distant Neptune.

Derived from text

*Neptune Atmosphere; Neptune (Planet); Polar Regions; Planetary Systems; Telescopes*

**20080001602** California Inst. of Tech., CA, USA

### **Recent Progress in Gamma-ray Bursts**

Soderberg, Alicia; Berger, Edo; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 28, 32-34; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

The launch of the Swift satellite in November 2004 heralded a new era in the study of gamma-ray bursts (GRBs) and their use as powerful probes of the high-redshift universe. Already known to possess bright optical and near-infrared 'afterglows,' gamma-ray bursts can now be pinpointed on the sky faster and more accurately than ever before, allowing us to address fundamental questions about the nature of these powerful explosions. We also use them as lighthouses for the study of the chemical and star-formation evolution of high-redshift galaxies and the intergalactic medium. Of primary importance in the context of understanding where these events originate is the nature of the progenitors of both the long-duration gamma-ray bursts (longer than two seconds), which appear to be related to the death of massive stars, and the mysterious short-duration bursts for which no afterglows had been found previously. Thanks to their rapid response capability (see article by Katherine Roth stating on page 35 of this issue), the Gemini telescopes have played a central role in addressing these questions.

Derived from text

*Gamma Ray Bursts; Telescopes; Supernovae; Astronomical Observatories*

**20080001603** Gemini Observatory, Hilo, HI, USA

**Science of Seeing: An International Symposium**

Michaud, Peter; Rigaut, Francois; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 46-48; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

A milestone was reached on March 20-22, 2007, when close to a hundred atmospheric scientists, instrumentalists, astronomers, meteorologists and others interested in the intersection of astronomy and our atmosphere came together on the Big Island of Hawaii. Gathering these two 'upward-looking' disciplines in the Symposium on Seeing was viewed by many participants as a long-overdue development. The presentations and informal discussions on topics ranging from how to monitor atmospheric seeing to the forecasting models used to predict seeing over astronomical observatories will undoubtedly lead to many new collaborations that will significantly advance both sciences. 'Over the past 20 years, astronomers have realized the importance of understanding how the turbulent characteristics of the Earth's atmosphere affect the quality of their observations. The atmospheric scientists are poised to help them,' said Craig Foltz, Program Director of the Division of Astronomical Sciences at the National Science Foundation, who participated in the meeting held at the Keauhou Beach Resort just south of Kona, Hawaii. 'The enthusiastic confluence of the two groups seen at this meeting gives us hope that we are on the verge of realizing immense gains in telescope performance by measuring, predicting and correcting for the blurring effects of the atmosphere. It is an exciting time to be an astronomer.' Over the course of the three-day meeting, nearly 50 oral presentations and more than 20 posters shared research on topics ranging from the instruments used to monitor and measure atmospheric turbulence to how this information can be applied in practical forecasts for astronomical observations. 'It is very exciting as a meteorologist to witness the growing ability of the observatories to use forecast atmospheric conditions to adjust their observing strategies and maximize the science that can be achieved,' said Steve Businger, who spearheaded the initiative for this symposium.

Derived from text

*Seeing (Astronomy); Astronomical Observatories; Rangefinding; Astronomy; Atmospheric Effects; Atmospheric Turbulence*

**20080001604** California Inst. of Tech., CA, USA

**The Delicate Trails of Starbirth**

Soderberg, Alicia; Berger, Edo; Gemini Focus: Newsletter of the Gemini Observatory; June 2007, pp. 29-34; In English; See also [20080001594](#); Copyright; Avail.: Other Sources

Using the recently commissioned Gemini North Laser Guide Star (LGS) system, a stunning image of the 'Bullets' region of the Orion Nebula was obtained on the night of March 6, 2007. The adaptive optics (AO) near-infrared image appears on the cover of this issue (and as part of the poster on the next two pages). The Orion bullets were first seen in a visible-light image in 1983. By 1999 infrared images led astronomers to conclude that these were clumps of gas ejected from deep within the nebula following a violent event connected with the recent formation of a cluster of massive stars. The bullets are speeding outward from the cloud at up to 400 kilometers (250 miles) per second, more than a thousand times faster than the speed of sound. The typical size of the bullet tips is about ten times the size of Pluto's orbit around the Sun and they are estimated to be less than a thousand years old. The wakes are about a fifth of a light-year long. Clouds of iron atoms at each bullet's tip glow brightly (colored blue) as they are shock-heated by friction to around 5000 C (10,000 F). Molecular hydrogen, which makes up the bulk of the bullets and the surrounding gas cloud, is destroyed at the tips by violent collisions between the high-speed bullets and molecules in the cloud. On the trailing edges of the bullets, however, the hydrogen is not destroyed, but instead heated to about 2000 C (4000 F). As the bullets plow through the clouds they leave behind distinctive tubular wakes (colored orange) that shine like bullet tracers due to the heated molecular hydrogen gas.

Derived from text

*Star Formation; Orion Nebula; Adaptive Optics; Infrared Imagery; Laser Guide Stars; Massive Stars; Shock Heating*

**20080001959** RAND Corp., Santa Monica, CA USA

**Habitable Planets for Man**

Dole, Stephen H; Jan 2007; 177 pp.; In English

Report No.(s): AD-A473471; RAND/CB-179-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

'Habitable Planets for Man' examines and estimates the probabilities of finding planets habitable to human beings, where they might be found, and the number there may be in our own galaxy. The author presents in detail the characteristics of a planet that can provide an acceptable environment for humankind, itemizes the stars nearest the earth most likely to possess habitable planets, and discusses how to search for habitable planets. Interestingly for our time, he also gives an appraisal of the earth as a planet and describes how its habitability would be changed if some of its basic properties were altered. 'Habitable Planets for Man' was published at the height of the space race, a few years before the first moon landing, when it was assumed

that in the not-too-distant future human beings 'will be able to travel the vast distances to other stars.' More than forty years after its initial publication, and to celebrate RAND's 60th Anniversary, RAND is proud to bring this classic work back into print in paperback and digital formats.

DTIC

*Habitability; Planets; Probability Theory*

## 90

### ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

**20080000993** Boeing Co., Seattle, WA USA

#### **Materials on the International Space Station - 6 (MISSE-6)**

Pippin, Harold G; Nov 30, 2006; 20 pp.; In English

Contract(s)/Grant(s): FA9550-O5-2-0001

Report No.(s): AD-A472619; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA472619>

The original design criteria were to use battery power and self-contained data loggers for active experiments. About a year into the project, NASA decided that it was preferable for MISSE(Materials on the International Space Station)-6 experiments to draw power from the ISS(International Space Station) power grid and minimize battery use. Due to continued high interest in flight experiment opportunities, the scope of MISSE-6 was increased to allow participation of several additional organizations. This required the use of two PECs to accommodate all the experiments. The Naval Research Laboratory, The Air Force Academy, NASA LaRC, and NASA MSFC added experiments. Sandia National Laboratory, Utah State University, NASA GRO, The Aerospace Corporation, each increased the scope of their individual experiments. The final assembly and functional testing of the integrated MISSE-6 experiments will take place in the spring of 2007. Delivery to NASA KSC is scheduled for August, 2007 and the launch is scheduled for December, 2007. For planning purposes, the mission duration is set at 9 months. This time interval could change to an exposure period as short as 6 months, or as long as 1 year, depending on Space Shuttle launch schedules and EVA opportunities.

DTIC

*Aerospace Environments; Experiment Design; International Space Station*

**20080001683** Air Force Research Lab., Hanscom AFB, MA USA

#### **Ion Scattering in a Self-Consistent Cylindrical Plasma Sheath**

Figueroa, Shana S; Cooke, D L; Gatsonis, Nikos A; Apr 2005; 15 pp.; In English

Contract(s)/Grant(s): Proj-5021

Report No.(s): AD-A473164; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473164>

Results are presented from a study of charged particle scattering about a charged wire in an ionospheric plasma. The one dimensional case assumes an infinite wire in an unmagnetized plasma with finite and equal ion and electron temperatures. Because particle energy and angular momentum are conserved in such a formulation, the results have the potential to provide a standard against which to compare more complicated electrodynamic tether simulations. Results indicate that higher plasma shielding limits the range of impact parameters that experience significant scattering, and that attracted particles entering tangent to the sheath experience increased scattering. The results also show that there are significant changes in orbital trajectories between different space charges within the OML limit.

DTIC

*Charged Particles; Cylindrical Plasmas; Ion Scattering; Plasma Sheaths; Plasmas (Physics); Space Charge*

**20080001901** Michigan Univ., Ann Arbor, MI USA

#### **Comprehensive Solar-Terrestrial Environment Model (COSTEM) for Space Weather Predictions**

Gombosi, Tamas I; Jul 2007; 33 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0359

Report No.(s): AD-A473348; F004449; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our team proposed the development of a modular, adaptive, parallel software framework for modeling the Sun-Earth system. The goal of the project was the development of a large-scale model of the solar-terrestrial environment allowing a

fuller understanding of space weather and a framework to test theories and investigate the broad implications of new observations. Particular attention was to be devoted to CME formation, propagation, and interaction with the magnetosphere; SEP acceleration in the low corona, SEP acceleration in the interplanetary medium, and SEP transport. We are very proud to note that all four goals have been met. In addition, this project supported a large number of science publications, conference presentations as well as Ph.D. students and postdocs. In the body of this final report we provide details of the Space Weather Modeling Framework, some of the science highlights and programmatic experience we gained with this exciting project.

DTIC

*Aerospace Environments; Environment Models; Forecasting; Space Weather*

**20080002348** Air Force Research Lab., Wright-Patterson AFB, OH USA

**Operability and Efficiency Performance of Ultra-Compact, High Gravity (g) Combustor Concepts (Postprint)**

Zelina, Joseph; Greenwood, Roger T; Shouse, Dale T; Jul 2007; 11 pp.; In English

Contract(s)/Grant(s): Proj-3048

Report No.(s): AD-A473495; AFRL-PR-WP-TP-2007-235; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473495>

This paper presents a parametric design study of the Ultra-Compact Combustor (UCC), a novel design based on trapped-vortex combustor (TVC) work that uses high swirl in a circumferential cavity to enhance reaction rates via high cavity g-loading on the order of 3000 g's. Increase in reaction rates translates to a reduced combustor volume. Three combustor geometric features were varied during experiments which included (1) high-g cavity flame-holding method, (2) high-g cavity to main airflow transport method, and (3) fuel injection method. Experimental results are presented for these combustor configurations and results have shown promise for advanced engine applications. Lean blowout fuel-air ratio limits at 25-50% the value of current systems were demonstrated. Combustion efficiency was measured over a wide range of UCC operating conditions. This data begins to build the design space required for future engine designs that may use these novel, compact, high-g combustion systems.

DTIC

*Combustion Chambers; Fuel-Air Ratio; Gravitation*

**20080002438** Florida Univ., Gainesville, FL USA

**Dual Mechanism Nonlinear Response of Selected Metal Organic Chromophores**

Peak, John D; Oct 1, 2007; 146 pp.; In English

Report No.(s): AD-A473658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA473658>

13 The goal for the research described herein is the development of a series of transition metal based metal organic chromophores that display both two-photon and excited state absorption (TPA/ESA) character. With this goal in mind, we present the preparation and photophysical characterization for a series of metal-organic chromophores containing a two photon absorbing bipyridine core combined with a transition metal component which yields a long-lived triplet excited state. The combination of these two photophysical properties represents a dual mode nonlinear optical (NLO) mechanism. Three major areas of interest for this project are addressed here. First, to develop and instrument an in-house photophysical apparatus with the ability to evaluate and measure two photon activity as well as detect nonlinear optical responses. Second, to synthesize, characterize and evaluate an all organic chromophore system, centered on a bipyridine core, which utilizes known TPA architecture. Lastly, to synthesize, characterize and evaluate the metal organic analogs of the TPA chromophore system utilizing transition metals with high spin-orbit coupling values which help create long-lived triplet excited states leading to a possible ESA. The metalorganic analogs in turn should exhibit a dual mechanism for NLO response comprised of both TPA and ESA.

DTIC

*Chromophores; Nonlinear Systems; Nonlinearity; Organometallic Compounds*

## LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

**2008000341** British National Space Centre, London, UK

**space:uk, October 2007, Issue 23**

Bibi, Azara, Editor; October 2007; 28 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

Welcome to space:uk. It is 50 years since the first satellite Sputnik was launched into space and since then groundbreaking technological advances have helped us to understand more about our own planet, the Solar System and the Universe beyond. In this issue we look at the UK space community in 1957 and how British scientists and engineers were an integral part of this new age of exploration and discovery. We also find out about some of today's missions-the UK-built Disaster Monitoring Constellation which helps governments and aid agencies to plan relief efforts when disaster strikes. The constellation was used by the UK Government to monitor the recent floods in north and south-west England. And looking ahead, we report on a new working group investigating the future of space exploration and how the UK expects to be at the forefront of advances in space technology.

Derived from text

*Solar System; Space Exploration; Space Missions; Aerospace Sciences; UK Space Program*

**2008000348** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

**Planned Activity Complexity Evaluation (PACE): Applied to Mars Exploration Rovers Surface Activities**

Trebi-Ollennu, Ashitey; Diaz-Calderon, Antonio; July 11, 2007; 27 pp.; In English

Contract(s)/Grant(s): NAS7-03001

Report No.(s): JPL-Publ- 07-4; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/2008000348>; <http://hdl.handle.net/2014/40410>

An Activity Plan for a spacecraft consists of a time-ordered set of engineering and science activities to be performed by the spacecraft over a specified time period (hours, days, weeks, months etc). Methodologies for measuring the degree of complexity of spacecraft Planned Activities by Earth-based operators is lacking in the spacecraft operations literature. This paper describes a new methodology for the evaluation of the complexity of planned spacecraft activities by Earth-based operators. The methodology is based on a novel computation of the Combined Activity Sequences Entropy (CASE). A command sequence (or sequence) is an ordered list of commands with associated arguments and control flags that will be executed by the spacecraft onboard sequence engine. Each activity in the Activity Plan is expanded into command sequence, and may comprise multiple command sequences. The goal of this research is to develop a methodology which measures the degree of complexity of a spacecraft Planned Activity. For each activity command sequence, a Sequence Entropy (SE) is computed based on the concept of entropy from information theory. The overall Planned Activity Complexity Evaluation (PACE) is computed using the Combined Activity Sequences Entropy (CASE), activity constraints and the resources (e.g. time) expended by the spacecraft planning team to build the command sequences. Finally, results from applying PACE to the Mars Exploration Rover (MER) mission robotic arm in-situ activities over a period of 1000 sols are presented.

Author

*Roving Vehicles; Robot Arms; Sequencing; Mars Exploration*

**2008002207** NASA Langley Research Center, Hampton, VA, USA

**The Potential for Imaging in Situ Damage in Inflatable Space Structures**

Madaras, Eric I.; Anastasi, Robert F.; Seebo, Jeffrey P.; Studor, George; McMakin, Douglas L.; Nellums, Robert; Winfree, William P.; July 22, 2007; 29 pp.; In English; 34th Annual Review of Progress in Quantitative Nondestructive Evaluation (QNDE 2007), 22-27 Jul. 2007, Golden, CO, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 401769.06.03.04.02.12; Copyright; Avail.: CASI: [A03](#), Hardcopy

NASA is investigating the use of inflatable habitat structures for orbital transfer and planetary applications. Since space structures are vulnerable to damage from micrometeoroid and orbital debris, it is important to investigate means of detecting such damage. This study is an investigation into methods for performing non-destructive evaluation (NDE) on inflatable habitat modules. Results of this work showed that various electromagnetic imaging modalities from microwaves to terahertz

imaging have the greatest potential for a viable, portable, NDE tool which could possibly be deployed aboard an inflatable habitat module.

Author

*Damage; Imaging Techniques; Inflatable Space Structures; In Situ Measurement; Spacecraft Structures*

**20080002279** NASA Glenn Research Center, Cleveland, OH, USA

**Digging and Pushing Lunar Regolith: Classical Soil Mechanics and the Forces Needed for Excavation and Traction**

Wilkinson, Allen; DeGennaro, Alfred; [2006]; 44 pp.; In English; Original contains color and black and white illustrations  
Contract(s)/Grant(s): WBS 511563.02.02; No Copyright; Avail.: Other Sources

There are many notional systems for excavating lunar regolith in NASA's Exploration Vision. Quantitative system performance comparisons are scarce in the literature. This paper focuses on the required forces for excavation and traction as quantitative predictors of system feasibility. The rich history of terrestrial soil mechanics is adapted to extant lunar regolith parameters to calculate the forces. The soil mechanics literature often acknowledges the approximate results from the numerous excavation force models in use. An intent of this paper is to examine their variations in the lunar context. Six excavation models and one traction model are presented. The affects of soil properties are explored for each excavation model, for example, soil cohesion and friction, tool-soil adhesion, and soil density. Excavation operational parameters like digging depth, rake angle, gravity, and surcharge are examined. For the traction model soil and operational and machine design parameters are varied to probe choices. For example, wheel width and diameter, as well as vehicle mass, are varied to offer design guidance. Mathematical anomalies are noted for several models. One conclusion is that the excavation models yield such disparate results that lunar-field testing is prudent. All the equations and graphs presented have been programmed for design use. Parameter ranges and units are included.

Author

*Lunar Rocks; Lunar Soil; Regolith; Soil Science; Lunar Excavation Equipment; Mathematical Models*

**20080002341** NASA Marshall Space Flight Center, Huntsville, AL, USA

**Lunar International Science Coordination/Calibration Targets**

Head, J. W.; Issacson, P.; Petro, N.; Runyon, C.; Ohtake, M.; Foing, B.; Grande, M.; October 02, 2007; 2 pp.; In English; 46th Vernadsky/Brown Microsymposium and Space Week, 2-5 Oct. 2007, Moscow, Russia; Original contains black and white illustrations

Contract(s)/Grant(s): NNM05AB26C; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080002341>

A new era of international lunar exploration has begun and will expand over the next four years with data acquired from at least four sophisticated remote sensing missions: KAGUYA (SELENE) [Japan], Chang'E [China], Chandrayaan-I [India], and LRO [United States]. It is recognized that this combined activity at the Moon with modern sophisticated sensors will provide unprecedented new information about the Moon and will dramatically improve our understanding of Earth's nearest neighbor. It is anticipated that the blooming of scientific exploration of the Moon by nations involved in space activities will seed and foster peaceful international coordination and cooperation that will benefit all. Summarized here are eight Lunar International Science Coordination/Calibration Targets (L-ISCT) that are intended to a) allow cross-calibration of diverse multi-national instruments and b) provide a focus for training young scientists about a range of lunar science issues. The targets, discussed at several scientific forums, were selected for coordinated science and instrument calibration of orbital data. All instrument teams are encouraged to participate in a coordinated activity of early-release data that will improve calibration and validation of data across independent and diverse instruments.

Derived from text

*International Cooperation; Lunar Exploration; Moon; Selenology; Lunar Geology*

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 *Space Radiation*.

**20080000777** NASA Marshall Space Flight Center, Huntsville, AL, USA

**The Solar Ultraviolet Magnetograph Investigation Sounding Rocket Program**

West, E. A.; Kobayashi, K.; Davis, J. M.; Gary, G. A.; August 26, 2007; 12 pp.; In English; SPIE Optics and Photonics:

Optical Engineering and Applications, 26-30 Aug. 2007, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This paper will describe the objectives of the Marshall Space Flight Center (MSFC) Solar Ultraviolet Magnetograph Investigation (SUMI) and the unique optical components that have been developed to meet those objectives. A sounding rocket payload has been developed to test the feasibility of magnetic field measurements in the Sun's transition region. The optics have been optimized for simultaneous measurements of two magnetic sensitive lines formed in the transition region (CIV at 1550 Å and MgII at 2800 Å). This paper will concentrate on the polarization properties SUMI's toroidal varied-line-space (TVLS) gratings and its system level testing as we prepare to launch in the Summer of 2008.

Author

*Sounding Rockets; Magnetometers; Ultraviolet Detectors; Solar Instruments; Optical Equipment*

**2008000858** NASA Glenn Research Center, Cleveland, OH, USA

### **Apparent Relations between Solar Activity and Solar Tides**

Hung, Ching-cheh; [2007]; 46 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 843515.01.15.03; No Copyright; Avail.: Other Sources

A solar storm is a storm of ions and electrons from the Sun. Large solar storms are usually preceded by solar flares. Because these storms can be destructive, the ability to forecast these storms is important. Here, relations between the unpredictable solar flares and the predictable solar tides were observed, which may be useful for forecasting solar storms. The majority of the largest solar flares were observed to start when one or more of the tide-producing planets (Mercury, Venus, Earth, and Jupiter) were either nearly above the event positions or at the opposing end of the Sun. Tides appear to trigger solar flares. Separately, an 11-year planet alignment cycle was observed from daily planet positions, which supports the hypothesis of resonance and beat existing between the cycle of solar tides and the cycle of nontidal solar activity.

Author

*Solar Storms; Electrons; Ions; Solar Cycles; Solar Activity; Tides; Solar Flares; Forecasting; Synchronism*

**20080002231** Science Applications International Corp., San Diego, CA, USA

### **Using Global Simulations to Relate the Three-Part Structure of Coronal Mass Ejections to in Situ Signatures**

Riley, Pete; Lionello, Roberto; Mikic, Zoran; Linker, Jon; [2008]; 7 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

White-light observations of coronal mass ejections (CMEs) often show the classic 'three-part' structure consisting of (1) a bright front; (2) a dark cavity; and (3) a bright, compact core. It has proven difficult to unambiguously associate these features with in situ measurements of interplanetary CMEs (ICMEs), in all but a few cases. In this study we use a global MHD model to simulate the eruption and evolution of a CME out to 0.25 AU, allowing us to continuously track these features from the Sun and through the solar wind. Our results support the generally held view that the interplanetary flux rope corresponds to the dark cavity. We find that the bright front merges with solar wind material swept up by the ICME. Thus, the sheath material found ahead of fast ejecta is in fact composed from both ambient solar wind material, as well the bright front. We also note that, in this simulation, the bright front is formed from the overlying streamer configuration from within which the CME erupted and is not itself coronal material swept up during the early phase of the eruption. The conclusions reached in this study are undoubtedly sensitive to the initial configuration and mechanism used to initiate the CME, and thus care should be taken when using them to interpret specific observations. On the other hand, they provide a unique, unbroken connection between remote solar and interplanetary observations. Ultimately, detailed comparisons between observations and simulation results may be able to constrain or even rule out some mechanisms of CME initiation.

Author

*Coronal Mass Ejection; In Situ Measurement; Simulation; Astrophysics; Imaging Techniques*

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