National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 46 Number 08

April 28, 2008

WHAT'S INSIDE

NASA STI Program ... in Profile

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- NASA, NASA contractor, and NASA grantee reports
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- NASA-owned patents and patent applications
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- Domestic and foreign dissertations and theses

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Social and Information Sciences

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Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 46, NUMBER 08 APRIL 28, 2008

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.

20080014259 NASA Langley Research Center, Hampton, VA, USA

The Isolated Synthetic Jet in Crossflow: A Benchmark for Flow Control Simulation

Schaeffler, Norman W.; Jenkins, Luther N.; AIAA Journal; [2006]; Volume 44, No. 12, pp. 2846-2856; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): 23-762-55-MC; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014259

An overview of the data acquisition, reduction, and uncertainty of experimental measurements made of the flowfield created by the interaction of an isolated synthetic jet and a turbulent boundary layer is presented. The experimental measurements were undertaken to serve as the second of three computational fluid dynamics validation databases for Active Flow Control. The validation databases were presented at the NASA Langley Research Center Workshop on CFD Validation of Synthetic Jets and Turbulent Separation Control in March, 2004. Detailed measurements were made to document the boundary conditions for the flow and also for the phase-averaged flowfield itself. Three component Laser-Doppler Velocimetry, 2-D Particle Image Velocimetry, and Stereo Particle Image Velocimetry were utilized to document the phase-averaged velocity field and the turbulent stresses.

Author

Jet Flow; Turbulent Boundary Layer; Computational Fluid Dynamics; Active Control; Exhaust Flow Simulation

20080014309 NASA Glenn Research Center, Cleveland, OH, USA

Blade-to-Blade Variations in Shocks Upstream of Both a Forward-Swept and an Aft-Swept Fan

Podboy, Gary G.; Krupar, Martin J.; October 2006; 22 pp.; In English

Contract(s)/Grant(s): WBS 22-781-30-10

Report No.(s): NASA/TM-2006-213445; E-14981; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014309

Detailed laser Doppler velocimeter (LDV) flow field measurements were made upstream of two fans, one forward-swept and one aft-swept, in order to learn more about the shocks which propagate upstream of these rotors when they are operated at supersonic tip speeds. The blade-to-blade variations in the flows associated with these shocks are thought to be responsible for generating Multiple Pure Tone (MPT) noise. The measured blade-to-blade variations are documented in this report through a series of slideshows which show relative Mach number contours computed from the velocity measurements. Data are presented for the forward-swept fan operating at three speeds (corresponding to tip relative Mach numbers of 0.817, 1.074, and 1.189), and for the aft-swept fan operating at two (tip relative Mach numbers of 1.074 and 1.189). These LDV data illustrate how the perturbations in the upstream flow field created by the rotating blades vary with axial position, radial position and rotor speed. As expected, at the highest tested speed the forward-swept fan swallowed the shocks which occur in the tip region, whereas the aftswept fan did not. This resulted in a much smaller flow disturbance just upstream of the tip of the forward-swept fan. Nevertheless, further upstream the two fan flows were much more similar.

Author

Laser Doppler Velocimeters; Perturbation; Rotor Speed; Supersonic Speed; Velocity Measurement; Upstream; Flow Distribution; Mach Number

20080015616 Army Aviation and Missile Research Develoment Engineering Center, Redstone, AL USA
An Assessment of Productive Computational Fluid Dynamics for Aerodynamic Design
Vaughn, Jr , Milton E; Auman, Lamar M.; Jan 2008; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476148; ARMDEC/SSDC-TR-AMR-SS-08-08; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) has been applying a Government-developed, productivity-oriented, Computational Fluid Dynamics (CFD) methodology to the aerodynamic design of Army missiles. This methodology, dubbed Enter Tunnel Analysis (ETA), uses a robust Euler solver and automated grid generation software to drastically reduce the time required to set up and execute flow field computations. ETA is described and applied to two hypervelocity missile configurations; one using a bent nose for aerodynamic control and the other using traditional canards. Comparisons are made with wind tunnel data to assess ETA's ability to produce meaningful results for use by aerodynamic designers.
DTIC
Aerodynamics; Computational Fluid Dynamics; Flow Distribution

20080015631 NASA Langley Research Center, Hampton, VA, USA
Status, Plans and Initial Results for Ares I Crew Launch Vehicle Aerodynamics
Huebner, Lawrence D.; Hall, Robert M.; Haynes, Davy A.; Pamadi, Bandu N.; Taylor, Terry L.; Seaford, C. Mark; January 2008; 11 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015631

Following the completion of NASA s Exploration Systems Architecture Study in August 2004 for the NASA Exploration Systems Mission Directorate (ESMD), the Ares Projects Office at the NASA Marshall Space Flight Center was assigned project management responsibilities for the design and development of the first vehicle in the architecture, the Ares I Crew Launch Vehicle (CLV), which will be used to launch astronauts to low earth orbit and rendezvous with either the International Space Station or the ESMD s earth departure stage for lunar or other future missions beyond low Earth orbit. The primary elements of the Ares I CLV project are the first stage, the upper stage, the upper stage engine, and vehicle integration. Within vehicle integration is an effort in integrated design and analysis which is comprised of a number of technical disciplines needed to support vehicle design and development. One of the important disciplines throughout the life of the project is aerodynamics. This paper will present the status, plans, and initial results of Ares I CLV aerodynamics as the project was preparing for the Ares I CLV Systems Requirements Review. Following a discussion of the specific interactions with other technical panels and a status of the current activities, the plans for aerodynamic support of the Ares I CLV until the initial crewed flights will be presented. Keywords: Ares I Crew Launch Vehicle, aerodynamics, wind tunnel testing, computational fluid dynamics
Author
Computational Fluid Dynamics; Ares 1 Launch Vehicle; Low Earth Orbits; Aerodynamics; Wind Tunnel Tests; Ares 5 Cargo Launch Vehicle

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.

20080014253 NASA Ames Research Center, Moffett Field, CA, USA
Concept and Laboratory Analysis of Trajectory-Based Automation for Separation Assurance
McNally, David; Gong, Chester; August 21, 2006; 17 pp.; In English; AIAA Guidance, Navigation and Control Conference and Exhibit, 21-24 Aug. 2006, Keystone, CO, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NNA05CP88A
Report No.(s): AIAA Paper-2006-6600; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014253

An operating concept and a laboratory analysis methodology were developed and tested to examine how four-dimensional trajectory analysis methods could support higher levels of automation for separation assurance in the National Airspace System. Real-time simulations were conducted in which a human controller generated conflict resolution trajectories using an

automated trial planning resolution function, but only in response to conflicts detected and displayed by an automatic conflict detection function. Objective metrics were developed to compare aircraft separation characteristics and flying time efficiency under automated operations to that of today's operations using common airspace and traffic scenarios. Simulations were based on recorded air traffic data from Fort Worth and Cleveland Centers and conducted using today's had nearly two-times today's traffic levels. Results suggest that a single controller using trajectory-based automation and data link communication of control clearances to aircraft could manage substantially more traffic than they do now with improved route efficiency while maintaining separation. The simulation and analysis capability provides a basis for further analysis of semi-automated, or fully automated, separation assurance concepts.
Author
Air Traffic; Trajectory Analysis; Simulation; Flight Paths; Air Traffic Control; Automation; Decision Support Systems

20080014454 Naval Postgraduate School, Monterey, CA USA
Auction Theory and Its Potential Use in the Army Aviation Bonus System
Verenna, Tony K; Dec 2007; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475852; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475852

The USA Army is increasing its force by 65,000 troops over the next few years. Included in this increase are Army aviators. Retention of the current soldiers in uniform is becoming very difficult as the deployment schedule of the current Global War on Terrorism wears down the individual aviator. Army Aviation is included in this build up of forces yet it must also compete with the amount of jobs becoming available as the baby boomer generation retires and leaves gaps in both the civilian pilot workforce for commercial airlines and also the USA Customs air inventory. This thesis will explore the Aviation Incentive program from its outset. It will then continue with a discussion of Auctions and Auction Theory. It will conclude with a game theory approach and other mathematical approaches on bidding in auctions. Combining Auction Theory with the mathematical approach provides the bidder in an auction a more educated decision in their bidding strategy. Utilizing Auctions for Aviator retention allows the Army to be more flexible in determining a value for a bonus rather than limited by the offer of a static amount which may or may not help with retention.
DTIC
Aircraft Pilots; Decision Theory; Game Theory; Personnel Management

20080014461 Naval Postgraduate School, Monterey, CA USA
Defense Travel System (DTS) Airline Ticket Price Analysis: Do DTS Ticket Prices Differ From Other Online Tickets Available for Naval Postgraduate School Travelers
Copeland, Alan F; Mazza, Dorinda M; Dec 2007; 67 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475867; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475867

Study compares airline tickets purchased through the Defense Travel System (DTS) for Naval Postgraduate School (NPS) travelers to prices for similar tickets available at online travel agent (OTA) and carrier websites. The study's purpose is to determine if prices are significantly different and if savings can be achieved by purchasing tickets from different sources. The study finds that DTS tickets are cheaper than carrier refundable tickets, but more expensive than nonrefundable carrier and OTA tickets. Sensitivity analysis indicates nonrefundable tickets would have to average 1.83 and 2.72 changes per ticket, before itinerary changes offset cost savings for nonrefundable carrier and OTA tickets purchased, respectively. Similarly, 26% and 39% of nonrefundable carrier and OTA tickets would have to be canceled to offset saving. Ultimately, this study can help determine if traveler flexibility achieved by purchasing refundable DTS tickets at negotiated city-pair rates from carriers is worth the additional cost. This study shows the flexibility achieved through DTS refundable tickets available in the city-pair program comes with a cost; which is the potential savings that could be achieved by using nonrefundable tickets. Annualized, potential savings at NPS could amount as much as $271,007 if there are no itinerary changes or cancellations.
DTIC
Airline Operations; Schools

20080014463 Naval Postgraduate School, Monterey, CA USA
Network Payload Integration for the Scan-Eagle UAV
Lim, Han Leong; Dec 2007; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475874; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475874

With the increasing maturity of MESH network technology, it is inevitable that we exploit the synergistic capabilities in

networking of autonomous vehicles. The interconnectivity enables the sharing or dissemination of information between various nodes and has the capability to enhance communication range between a Ground Control Station (GCS) and autonomous aircraft which can then be expanded to several GCSs, or in a networked combination of Unmanned Aerial Vehicle (UAV), Unmanned Ground Vehicle (UGV) and Unmanned Surface Vehicle (USV). This thesis discusses the setup of the MESH network between the ScanEagle GCS and the ScanEagle UAV. It describes the modifications on the high gain antenna and the integration of an ITT MESH card radio into the ScanEagle. A study of the results conducted in Panama City to understand the limitations and constraints of several MESH nodes operating within a specified area is described, together with a discussion of the results and recommendations for further work.
DTIC
Control; Drone Vehicles; Networks; Payload Integration

20080014481 Naval Postgraduate School, Monterey, CA USA
A Model-Based Optimization Plan for the F-16 Pilot Training
Mise, Murat; Dec 2007; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475920; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475920

Pilot training is the most critical factor that determines the fighting capability of the Air Force. It is a very costly, lengthy and complex process, and therefore very hard to manage. The fighting capability today is the result of the hiring and training decisions made many years ago. Therefore, anticipatory planning is very important in pilot training, to reduce costs and increase fighting capability. The purpose of this project is to model and optimize the F-16 pilot training progression as a supply chain where each step in the process is seen as the 'supplier' of the next step. The attritions and reassigments of the pilots make this model complicated and there are also the constraints of scarce training resources such as instructors and equipment. The purpose of this project is to develop a model-based approach for reducing the cost of pilot training while improving the fighting capacity of the Air Force. In this research we develop a linear programming model to synchronize and balance the flow of pilots through the various stages of the supply chain. The model includes constraints such as capacity and manpower flows reflecting hiring and training of pilots. The optimization model is then tested and illustrated through a computational experiment based on realistic yet hypothetical data.
DTIC
F-16 Aircraft; Fighter Aircraft; Flight Training; Jet Aircraft; Pilot Training; Pilots

20080014492 Naval Postgraduate School, Monterey, CA USA
Organizational Design Analysis of Fleet Readiness Center Southwest Components Department
Montes, Jose F; Dec 2007; 133 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475949; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475949

The U.S. Navy's, Naval Aviation Enterprise has combined its Depot aircraft maintenance activities with the Aircraft Intermediate Maintenance facilities to form the Fleet Readiness Centers across the U.S. The merger creates newly formed organizations responsible for providing comprehensive aircraft maintenance support by combining personnel, technical expertise, equipment and facilities. The purpose of this MBA Project is to analyze the proposed organizational design elements of the FRCSW Components Department that resulted from the integration of the Naval Aviation Depot at North Island (NADEP N.I.) and the Aircraft Intermediate Maintenance Department North Island (AIMD N.I.) in San Diego, CA. The goal of this project is to evaluate possible misalignments in the current organizational design and structure of the organization, identify design gaps, and areas of duplication of effort. This project evaluates the current design through personnel interviews and is conducted with the sponsorship and assistance of the Fleet Readiness Center Southwest.
DTIC
Design Analysis; Maintenance; Military Aviation

20080014503 Naval Postgraduate School, Monterey, CA USA
Financial Challenges and Responsibilities in the Management of the Navy Flying Hour Program at the Squadron Level
Sarisen, Murat; Dec 2007; 61 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475968; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475968

There have been numerous graduate research projects written about the Navy Flying Hour Program at the Department of

Navy (DoN) level on down the chain of Command to the TYCOM level. But there is no research regarding the FHP in terms of how it is done and its affects and consequences at the squadron level. The primary purpose of this professional report is to bring to light the challenges faced by the squadron and the many obstacles that the Material Control Officer (MCO) has to overcome in meeting the demands set by Commander Naval Air Forces (CNAF) regarding the FHP. Due to the level of inexperience of Aviation Maintenance Officers graduating from Aviation Maintenance Officer School (AMO) who are tasked with the responsibilities as the squadron MCO, this professional report will serve as a reference source both at the micro (squadron) and macro (CNAF & DoN) levels of operation to increase understanding of the funds management process and, consequently, to improve such management.
DTIC
Military Aviation; Navy

20080014524 Naval Postgraduate School, Monterey, CA USA
Employing Organizational Modeling and Simulation to Deconstruct the KC-135 Aircraft's Programmed Depot Maintenance Flight Controls Repair Cell
Paskin, Matthew A; Trevino, Alice W; Dec 2007; 168 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476030; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476030

This research modeled and simulated the KC-135 aircraft's Programmed Depot Maintenance (PDM) Flight Controls Repair Cell to identify improvement opportunities for greater efficiency within the flight controls repair process. PDM is conducted by the 564th Aircraft Maintenance Squadron, 76th Aircraft Maintenance Group, Oklahoma City Air Logistics Center (OC-ALC), Tinker Air Force Base, Oklahoma. The researchers focused on the repair cell's internal formal and informal communication flows and information processing to evaluate the impact on flight controls repair throughput time. Computational organizational modeling was employed to examine organizational design modifications and their effect on repair cycle-time, project cost, and project risk. The modeling and simulation software used is based upon organizational design theory and information-processing research. To build the baseline organizational model that emulated the actual repair process, the researchers collected data through interviews with repair cell personnel and through observation of the repair process. Modifications called ''interventions' were developed to simulate and analyze organizational design changes. The study concludes with the recommendation of feasible organizational design alternatives for OC-ALC decision-makers to improve the flight controls repair process and throughput time.
DTIC
C-135 Aircraft; Flight Control; Maintenance; Military Operations; Refueling; Simulation

20080014681 Air Command and Staff Coll., Maxwell AFB, AL USA
Leveraging DMO's Hi-Tech Simulation Against the F-16 Flying Training Gap
McGrath, Shaun R; Apr 2005; 43 pp.; In English
Report No.(s): AD-A476205; AU/ACSC/2927/2004-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The task of training pilots to become and remain combat ready in modern fighter aircraft is an increasingly difficult endeavor. The U.S. Air Force's proliferation of high-tech simulators such as those found in the Mission Training Centers 'MTC' present a viable solution to closing the gap in training created by the complexity of advanced fighter aircraft. However, this proliferation resulted from a desire to fill gaps in realistic combat environment training produced by peacetime safety constraints. The purpose of this research is to examine leveraging hi-tech simulation assets against the every growing gap in training caused by a systematic reduction in the average fighter pilot's flying hours, coincident with a massive increase in fighter aviation technology. The F-16 community in particular, experienced a quantum leap in software and hardware technology advancement over the past decade. The most recent is the implementation of the Common Configuration Implementation Program 'CCIP'. Taking a basic day-VFR designed fighter, CCIP now merges technologies such as JHMCS, LINK 16, HTS, TGP, AAI, and all the associated 'smart precision' weapons into one platform. This exponential leap in capability on a single platform adds to an ever-widening training gap. The MTCs or DMO provides the best means to leverage simulation technology against those major training gaps created by multiple factors- keeping our fighter pilots proficient and combat ready.
DTIC
Education; F-16 Aircraft; Flight Simulators; Flight Training; Simulation

20080014696 Air Command and Staff Coll., Maxwell AFB, AL USA

Airspace Control Authority in Stability Operations: The Role of the USA Air Force in Rebuilding Afghanistan's National Airspace System

Grogan, Michael A; Apr 2005; 35 pp.; In English

Report No.(s): AD-A476300; AU/ACSC/6244/2004-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Despite a decade of war with the former Soviet Union, followed by years of harsh Taliban rule, Afghanistan still had a rudimentary national airspace control system prior to the start of Operation Enduring Freedom 'OEF'. However, very little of Afghanistan's air traffic infrastructure could be leveraged to safely support Coalition flight operations. Therefore, to ensure aviation safety, U.S. military forces shouldered the burden of providing airspace control for the country, to include all civil operations, and continue doing so to this day. This paper examines the USA Central Command Air Forces' 'USCENTAF' role in rebuilding Afghanistan's national airspace system during stability operations. Most issues presented are from the operational-level of command but have significant strategic-level implications. Ranging from the challenges of mixing military and civil aircraft operations to affecting aviation commerce of a nation, the analysis of these issues is focused through the doctrinally recognized lens of an airspace control authority 'ACA'

DTIC

Afghanistan; Air Traffic; Airspace; Control Stability; National Airspace System; United States

20080014820 Federal Aviation Administration, Hampton, VA, USA

Wake Vortex Research in the USA (WakeNet-USA)

Lang, Steve; Bryant, Wayne; June 19, 2006; 17 pp.; In English; Fifth Community Aeronautical Days, 19-21 Jun. 2006, Vienna, Austria; Original contains color illustrations

Contract(s)/Grant(s): WBS 23-305295.02.07.07.01; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014820

This viewgraph presentation reviews the cooperative work that FAA and NASA are engaged in to safely increase the capacity of the National Airspace System by studying the wake vortex operations. Wake vortex avoidance is a limiting factor in defining separation standards in the airport terminal area and could become a reducing separation standards in en route airspace.

CASI

Vortex Avoidance; Wakes; Air Traffic Control; Aircraft Approach Spacing; Aircraft Safety

20080015371 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD USA

Risk Factors for Parachute Injuries and Airborne Student Observations on the Parachute Ankle Brace

Knapik, Joseph J; Spiess, Anita; Darakjy, Salima; Grier, Tyson; Manning, Fred; Livingston, Elaine; Swedler, David; Amoroso, Paul; Jones, Bruce H; Oct 3, 2007; 72 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475918; USACHPPM-12-MA01Q2-08B; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475918

A questionnaire was administered to 1,956 students in Army Airborne training as part of an effort by the Military Training Task Force (MTTF) of the Defense Safety Oversight Council (DSOC) to evaluate the parachute ankle brace (PAB). Information provided by the questionnaire identified potential injury risk factors and comments on the PAB. Risk factors for injuries in the past year included service branch, Airborne recycling, less physical activity, older age, greater body weight, higher BMI, and (among Army personnel) slower 2-mile run time. Risk factors for jump week injuries included higher rank, longer time in service, older age, Airborne recycling, height, more body weight, not wearing the PAB, aircraft exit problems, an injury in the past year, and (for Army men) fewer push-ups and slower 2-mile run time. Students who had worn the brace were more likely to have favorable comments on the PAB compared with those who had not worn it. Most negative PAB comments were related to the heel strap and an improvement has been proposed and is in production. Students complained that the PAB rubbed on the legs, shin, ankle, and calf; this might be associated with the heel strap or pulling the ankle strap to tight; this problem might be alleviated by the strap improvement and/or better guidance on appropriate tightness for the ankle straps. Students also complained of difficulty in keeping the feet and knees together when wearing the PAB. This could be a matter of perception or some adaptation and accommodation may be required in this area.

DTIC

Injuries; Parachutes; Risk; Students; Supports

20080015452 NASA Langley Research Center, Hampton, VA, USA

Overview of the Small Aircraft Transportation System Project Four Enabling Operating Capabilities

Viken, Sally A.; Brooks, Frederick M.; Johnson, Sally C.; [2005]; 24 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://dx.doi.org/10.2514/1.20595

It has become evident that our commercial air transportation system is reaching its peak in terms of capacity, with numerous delays in the system and the demand still steadily increasing. NASA, FAA, and the National Consortium for Aviation Mobility (NCAM) have partnered to aid in increasing the mobility throughout the USA through the Small Aircraft Transportation System (SATS) project. The SATS project has been a five-year effort to provide the technical and economic basis for further national investment and policy decisions to support a small aircraft transportation system. The SATS vision is to enable people and goods to have the convenience of on-demand point-to-point travel, anywhere, anytime for both personal and business travel. This vision can be obtained by expanding near all-weather access to more than 3,400 small community airports that are currently under-utilized throughout the USA. SATS has focused its efforts on four key operating capabilities that have addressed new emerging technologies, procedures, and concepts to pave the way for small aircraft to operate in nearly all weather conditions at virtually any runway in the USA. These four key operating capabilities are: Higher Volume Operations at Non-Towered/Non-Radar Airports, En Route Procedures and Systems for Integrated Fleet Operations, Lower Landing Minimums at Minimally Equipped Landing Facilities, and Increased Single Pilot Performance. The SATS project culminated with the 2005 SATS Public Demonstration in Danville, Virginia on June 5th-7th, by showcasing the accomplishments achieved throughout the project and demonstrating that a small aircraft transportation system could be viable. The technologies, procedures, and concepts were successfully demonstrated to show that they were safe, effective, and affordable for small aircraft in near all weather conditions. The focus of this paper is to provide an overview of the technical and operational feasibility of the four operating capabilities, and explain how they can enable a small aircraft transportation system.

Author

Air Transportation; Commercial Aircraft; Routes; Organizations; Airports

20080015507 L-3 Communications Corp., Billerica, MA, USA

Trajectory-Oriented Approach to Managing Traffic Complexity: Operational Concept and Preliminary Metrics Definition

Idris, Husni; Vivona, Robert; Garcia-Chico, Jose L.; April 2008; 58 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNA07BB26C

Report No.(s): NASA/CR-2008-215121; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015507

This document describes preliminary research on a distributed, trajectory-oriented approach for traffic complexity management. The approach is to manage traffic complexity in a distributed control environment, based on preserving trajectory flexibility and minimizing constraints. In particular, the document presents an analytical framework to study trajectory flexibility and the impact of trajectory constraints on it. The document proposes preliminary flexibility metrics that can be interpreted and measured within the framework.

Author

Active Control; Trajectories; Distributed Parameter Systems; Air Traffic Control; Aircraft Approach Spacing

20080015538 NASA Dryden Flight Research Center, Edwards, CA, USA

Cooperative Conflict Avoidance Sensor Trade Study Report, Version 2

Nov. 30, 2004; 38 pp.; In English; Original contains color and black and white illustrations

Report No.(s): DFRC-239; CCA003-Rev2; Copyright; Avail.: CASI: A03, Hardcopy

This study develops evaluation criteria for systems and technologies against the Cooperative Conflict Avoidance (CCA) requirements for unmanned flight at and above FL430 as part of Step 1 of the Access-5 program. These evaluation criteria are then applied to both current and future technologies to identify those which might be used to provide an Equivalent Level of Safety (ELOS) for CCA. This document provides the results of this analysis of various systems and technologies intended for evaluation as part of the CCA work package.

Author

Air Traffic Control; Pilotless Aircraft; Unmanned Aircraft Systems; Collision Avoidance

20080015613 Naval Surface Warfare Center, Bethesda, MD USA

Logistics Enabler for Distributed Forces

Hope, Geoff; Kennell, Colen; Aug 2004; 73 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00024-01-WX-20594

Report No.(s): AD-A476380; NSWCCD-20-TR-2004/07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Advanced Logistics Delivery System (ALDS) is an advanced sea-based concept capable of providing rapid sustainment of goods and supply to dispersed military forces maneuvering ashore. The system consists of a shipboard mechanical launcher and an autonomous, unmanned glider designed to transport cargo such as food, ammunition, fuel and water. The glider is accelerated to high speed by the launcher. During its steep ascent, the kinetic energy provided to the glider by the launcher is converted into potential energy until the glider reaches its maximum altitude. The vehicle then glides at relatively slow speed to the delivery point. Onboard avionics control and guide the glider throughout its flight. This report provides an overview of the ALDS concept, a description of an innovative flying wing design for the ALDS glider, an overview of the launch ship design and identifies capability gaps for the technology. Two variants of the ALDS concept have been previously studied' at the Naval Surface Warfare Center, Carderock Division. The study focused on a catapult launched, fixed wing glider similar to recreational gliders and an air-dropped glider with inflatable wings. The study concluded that the catapult launched glider lacked sufficient range. Consequently, the preferred ALDS was determined to be an inflatable wing glider capable of launch via helicopter, fixed wing aircraft, or rocket at sufficient altitude to provide militarily useful range. Major limitations of such a concept are its dependence on high value manned aircraft, the operational complexity of handling and launching relatively large rockets at sea, and a relatively low cargo delivery rate.

DTIC

Cargo; Gliders; Launchers; Logistics

20080015629 NASA Langley Research Center, Hampton, VA, USA

The Small Aircraft Transportation System Project: An Update

Kemmerly, Guy T.; [2006]; 10 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015629

To all peoples in all parts of the world throughout history, the ability to move about easily is a fundamental element of freedom. The American people have charged NASA to increase their freedom and that of their children knowing that their quality of life will improve as our nation s transportation systems improve. In pursuit of this safe, reliable, and affordable personalized air transportation option, in 2000 NASA established the Small Aircraft Transportation System (SATS) Project. As the name suggests personalized air transportation would be built on smaller aircraft than those used by the airlines. Of course, smaller aircraft can operate from smaller airports and 96% of the American population is within thirty miles of a high-quality, underutilized community airport as are the vast majority of their customers, family members, and favorite vacation destinations.

Derived from text

Air Transportation; Airports; Civil Aviation

05
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.

20080014256 Army Research Lab., Hampton, VA, USA

Fatigue Life Methodology for Tapered Hybrid Composite Flexbeams

urri, Gretchen B.; Schaff, Jeffery R.; Composites Science and Technology; January 2006; Volume 66, Nos. 3-4, pp. 499-508; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): 23-745-60-RC; Copyright; Avail.: CASI: A03, Hardcopy

Nonlinear-tapered flexbeam specimens from a full-size composite helicopter rotor hub flexbeam were tested under combined constant axial tension and cyclic bending loads. Two different graphite/glass hybrid configurations tested under cyclic loading failed by delamination in the tapered region. A 2-D finite element model was developed which closely

approximated the flexbeam geometry, boundary conditions, and loading. The analysis results from two geometrically nonlinear finite element codes, ANSYS and ABAQUS, are presented and compared. Strain energy release rates (G) associated with simulated delamination growth in the flexbeams are presented from both codes. These results compare well with each other and suggest that the initial delamination growth from the tip of the ply-drop toward the thick region of the flexbeam is strongly mode II. The peak calculated G values were used with material characterization data to calculate fatigue life curves for comparison with test data. A curve relating maximum surface strain to number of loading cycles at delamination onset compared well with the test results.
Author
Fatigue Life; Hybrid Composites; Nonlinearity; Mathematical Models; Swept Wings; Beams (Supports); Helicopter Tail Rotors

20080014402 Air Force Research Lab., Wright-Patterson AFB, OH USA
Air Force/Industry F-35/F-22 Technology Interchange Workshop for Small Business Innovation Research (SBIR): Plenary Session
Havis, Charlie; White, John; Ebersole, C D; Heyer, Bob; Concha, Lou; Plant, Jr, Charles M; Nov 28, 2007; 202 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475726; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475726

The Air Force Research Laboratory (AFRL) and the F-22/F-35 System Program Office, in conjunction with their industry partners, are conducted the first Air Force / Industry F-35/F-22 Technology Interchange Workshop for Small Business Innovative Research (SBIR). The workshop was on November 28-29, 2007 in Fort Worth, Texas. This dual-track initiative is an enabler for Air Force and Industry to collaborate and focus our collective R&D investment strategies to meet the electronic systems needs for the warfighter. The workshop kicked off with a general session discussion, whereby AFRL and F-35/F-22 addressed the Air Force S&T vision and strategic plans, as well as giving a comprehensive overview of the Air Force F-35/F-22 needs. The program then broke off into SBIR One-on-One Sessions.
DTIC
Commerce; Industries; Military Technology; Research and Development

20080014406 Naval Postgraduate School, Monterey, CA USA
Design, Construction and Testing of a Prototype Holonomic Autonomous Vehicle
Volland, Kirk N; Dec 2007; 211 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475739; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475739

USA Department of Defense (DoD) autonomous vehicle efforts have concentrated research in areas that support development of unmanned ground and air battlefield vehicles. Little attention has been paid to applying robotics to automate routine tasks. A robotic solution consisting of a prototype holonomic vehicle is proposed to search for, detect, and remove debris that could cause foreign object damage (FOD) to turbine-engine aircraft operated from ships. Holonomic, or omnidirectional, motion was realized by solving the system of equations governing the vehicle's motion atop a plane surface. Translational motion without chassis rotation was achieved through motion control using a single board computer, a pulse width modulation (PWM) and optical isolation circuit, and a low-cost inertial measurement unit (IMU). Obstacle detection and avoidance was realized by constructing a microprocessor-controlled scanning ultrasonic sonar detector head and controller circuit. The sonar detector demonstrated 360 coverage and centimeter resolution. Rudimentary autonomous operation and wireless manual control via a Java graphical user interface (GUI) were achieved in an indoor environment.
DTIC
Aircraft Safety; Autonomous Navigation; Autonomy; Construction; Flight Safety; Foreign Bodies; Geometry; Graphical User Interface; Impact Damage; Prototypes; Remotely Piloted Vehicles

20080014431 Air Force Research Lab., Wright-Patterson AFB, OH USA
Development of an Integrated Aeroelastic Multibody Morphing Simulation Tool (Postprint)
Reich, Gregory W; Bowman, Jason C; Sanders, Brian; Frank, Geoffrey J; Nov 2007; 13 pp.; In English
Contract(s)/Grant(s): Proj-A01Y
Report No.(s): AD-A475802; AFRL-RB-WP-TP-2008-3009; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475802

This paper describes the development of a tool for simulating the flight of a morphing aircraft during the morphing

process. Also discussed are current-generation tools for modeling vehicle flight and illustrations of how these tools are as yet too immature for modeling of the flight of an aircraft during morphing of the wings. A framework is developed for modeling vehicle flight that incorporates vehicle morphing. The procedures outlined in the paper are sufficiently general to accommodate aircraft utilizing changes in sweep, span, or area. The current state of the art and the planned developments are illustrated through their application to the flight of a folding-wing vehicle.
DTIC
Aeroelasticity; Aircraft; Folding; Simulation; Wings

20080014447 Naval Postgraduate School, Monterey, CA USA
An Analysis of Retaining or Replacing Air Force Command and Control Aircraft
Austin, II, Joe J; Lynch, Horace R; Dec 2007; 113 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475844; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475844

This MBA Project's objective was to analyze information available to determine if the Air Force should retain or replace its command and control aircraft. To accomplish the objective, research pertaining to the Air Force's aircraft and requirements was conducted along with analyzing new aircraft available that can be modified for current and future missions. The project provides background information about the various missions command and control aircraft perform, as well as the importance of maintaining the capability. Current command and control aircraft, as well as potential aircraft that can replace the existing command and control aircraft, were researched to determine the cost and performance specifications. The current and potential aircraft were analyzed, and factors other than costs were also examined. The challenges facing the Air Force's recapitalization efforts were presented. These challenges include cost and funding priorities; schedule and production lead times; personnel; and facilities and support equipment. The completed product identifies if the Air Force should retain or replace command and control aircraft. Additional areas for further research were listed which could provide more information once more data becomes available to compare with the project findings.
DTIC
Command and Control; Electronic Aircraft; Government Procurement; Patrols; Replacing

20080014449 Naval Postgraduate School, Monterey, CA USA
Analysis of Fleet Readiness Center Southwest Concept Integration: New-Employee Orientation and Communication Processes
Clemmons, Francini R; Falconieri, Holly M; Dec 2007; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475846; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475846

Fleet Readiness Center Southwest has embraced integration of personnel and processes from Aircraft Intermediate Maintenance Departments and Naval Aviation Depots supporting Naval Aviation Maintenance. This transformation marks a change in Naval Aviation Maintenance history and will align Fleet Readiness centers with the Naval Aviation Enterprise vision. As civilian and military personnel begin working side-by-side, orientation, communication and process relationships are being redefined to combine the previous infrastructure of two organizations under one roof. The new relationships are designated to be comparable to the aviation maintenance industry's business structure to leverage opportunities for growth as well as sustainability for the industry. The authors analyzed new-employee orientation, personnel integration and communication processes to determine their effectiveness to convey FRCSW's vision and efforts for integration.
DTIC
Combat; Maintenance; Personnel

20080014456 Naval Postgraduate School, Monterey, CA USA
Tilt-Rotor or Helicopter? An Evaluation of the Way Ahead for Marine Corps Medium-Lift Aviation
Day, Stuart; Stoetzer, Karl; Zamora, Roel; Dec 2007; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475856; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475856

The purpose of this research project was to provide an evaluation of whether or not the V-22 Osprey is the best choice of aircraft to meet the Marine Corps medium-lift assault support needs. The goal of this project was to base the evaluation on unbiased research using methods and techniques learned in the Naval Postgraduate School s MBA core curriculum. The evaluation is based on analysis of the V-22 Osprey and the EH-101 helicopter using net present value (NPV) of procurement

cost, measures of overall effectiveness (MOE) for how each aircraft meets defined Marine Corps objectives, and a computer simulation to predict how each helicopter will perform given the same scenario. When considered together, the NPV, MOE, and computer simulation can be used to provide evaluation of whether or not the V-22 is truly the best aircraft to meet the Marine Corps medium-lift needs.
DTIC
Helicopters; Lift; Tilt Rotor Aircraft

20080014464 Naval Postgraduate School, Monterey, CA USA
The Extension of Wireless Mesh Networks Via Vertical Takeoff and Landing Unmanned Aerial Vehicles
Richerson, John P; Dec 2007; 213 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475876; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475876

The evolution of integrated circuits, wireless communications, and data networking makes wireless networks practical for military and law enforcement applications. The objective of this thesis is to test and to evaluate network performance and suitability of an 802.11 wireless access point enabled vertical take off and land (VTOL) unmanned aerial vehicle (UAV) functioning as an airborne sensor and communications relay platform. Also, by identifying the production process of a COTS Remote Controlled Helicopter equipped with a wireless access point, a system, comprised of discrete technologies and production steps can be defined to gain insight into defeating an Aerial Improvised Explosive Device (AIED). Understanding the true capabilities of a small VTOL UAV, its applicability to a wireless network, and the production system associated with the manufacture of an AIED will allow proper planning, application and utilization in support of security and Force Protection missions and scenarios.
DTIC
Aerial Reconnaissance; Drone Vehicles; Explosive Devices; Explosives; Pilotless Aircraft; Remote Sensors; Vertical Landing; Vertical Takeoff; Vertical Takeoff Aircraft

20080014465 Naval Postgraduate School, Monterey, CA USA
Minimum-Energy Flight Paths for UAVs Using Mesoscale Wind Forecasts and Approximate Dynamic Programming
Nachmani, Gil; Dec 2007; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475882; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475882

Fuel or battery consumption of unmanned aerial vehicles (UAVs) can be improved by utilizing or avoiding air currents. This thesis adopts a network modeling approach to formulate the problem of finding minimum energy flight paths. The relevant airspace is divided into small regions using a grid of nodes, inter-connected by arcs. A function, representing energy cost, is defined on every arc in terms of the solution of a constrained nonlinear program for the optimal local airspeed to fly in a given wind field. Then, shortest-path models are implemented on the network to find the optimal paths from an origin to a destination. Five models are studied and they correspond to cases of pre-planning of flight routes and dynamic updating of routes during the course of the flight. These models use three-dimensional grids of forecasted wind currents, produced by the Naval Research Laboratory's Coupled Ocean-Atmosphere Mesoscale Prediction System (COAMPS) with horizontal resolution of 1 km. One of the shortest-path models, a stochastic-dynamic model, assumes real-time measurement capabilities of the wind velocity in the vicinity of the UAV, through its GPS-INS system, and provides updated waypoints to follow after every measurement. For each model, the energy costs of the shortest-path solutions for 1000 randomized missions over a Nevada test site are simulated and compared to the energy costs of straight-line paths. For a 100 kg UAV, the dynamic model produces an average reduction of 15.1% in the energy consumption along 40 km long round trips, and an average reduction of 30.1% under windy conditions with average wind speeds larger than 15 m/s. A stochastic-dynamic model for maximum duration, solved using a heuristic algorithm, achieves an average increase of 32.2% in the flight duration for a 100 kg UAV.
DTIC
Drone Vehicles; Dynamic Programming; Electric Batteries; Flight Paths; Fuel Consumption; Mesometeorology; Mesoscale Phenomena; Weather Forecasting

20080014473 Naval Postgraduate School, Monterey, CA USA
Securing the Aviation Transportation System
Oldham, Paul; Dec 2007; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475907; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475907

The vulnerability of the Aviation Transportation System was once again highlighted on September 11 2001. Hijacking was

not a new phenomenon in aviation; it erupted in the late 1960s, hijackers used commercial airliners for transportation to Cuba. The hijack incidents slowly became more violent. Aviation security legislation and measures were championed after each major aviation hijack incident, but they were not always fully implemented. What was the status of aviation security leading up to 9/11? Have the improvements made to the Aviation Transportation System since 9/11 made the system less vulnerable? This thesis presents a comparative study of domestic aviation security measures applied to commercial passenger aviation. Security initiatives, the implementation of those initiatives, and security policies both pre and post 9/11 are described and examined in an effort to determine if the domestic Aviation Transportation System is more secure now than it was prior to September 11.
DTIC
Airline Operations; Commercial Aircraft; Security; Transportation

20080014475 Naval Postgraduate School, Monterey, CA USA
Track Spacing for An Archimedes Spiral Search by a Maritime Patrol Aircraft (MPA) in Anti-Submarine Warfare (ASW) Operations
Son, Byungsoo; Dec 2007; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475909; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475909

The military threat of hostile submarines is increasing and the need for effective Anti-Submarine Warfare (ASW) operations is also increasing. In response, the ROK government and military have improved their ASW capabilities. In this thesis, the recommended track spacing for an Archimedes spiral search in a datum search problem was studied. To find a recommended track spacing, three analytical approaches were explored. Each of three analytical approaches has its own strengths and weaknesses. This analysis combined three analytical functions into a single parameterized expression. To find the best-fit parameters maximizing probability of detection, a simulation experiment with a NOLH (Nearly Orthogonal Latin Hypercube) design was used.
DTIC
Antisubmarine Warfare; Curves (Geometry); Patrols; Spacing; Submarines; Warfare

20080014478 Naval Postgraduate School, Monterey, CA USA
A Follow-up Study on Wireless Power Transmission for Unmanned Air Vehicles
Toh, Leng H; Dec 2007; 109 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475913; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475913

This thesis was a continuation in part of a NPS project relating to microwave wireless power transmission for micro air vehicles (MAVs). The concept of using microwaves for transferring power in free space has existed since the beginning of the 20th century. The emphasis of this thesis is the experimental study of powering micro air vehicles via the use of using a microstrip rectenna (rectifying antenna) at 10 GHz. A microstrip rectenna was built and experiments were conducted to measure the efficiency of the rectenna elements. The conversion of radio frequency (RF) power into usable DC power was performed by a rectenna. Its function could be broken down into the following four stages: reception of radio frequency (RF) power prerectification filtering rectification and post-rectification filtering. A rectenna model based on past research by NPS students was simulated built and tested. The analysis and findings of the rectenna model were presented with suggested improvements highlighted.
DTIC
Drone Vehicles; Electric Power Transmission; Microwave Transmission; Wireless Communication

20080014479 Naval Postgraduate School, Monterey, CA USA
Design and Performance Evaluation Study of a Prototype of a Tactical Unmanned Aerial Vehicle
Adrian, Teng C; Dec 2007; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475917; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475917

This thesis aims to provide a low-cost solution through integrating commercial off-the-self (COTS) technologies to produce a prototype of a 'Tactical Unmanned Combat Aerial Vehicle UCAV' system that can be utilized by the front-line ground units in the near future. The Tactical UCAV is designed to enhance the information collection and autonomous precision strike capability of the ground units. The Tactical UCAV can also be deployed as sensor nodes as part of a larger

global information grid in a network-centric warfare operation. The proposed Tactical UCAV system is comprised of a Hunter Unmanned Aerial Vehicle (HUAV), which primarily carries high resolution sensors and communication devices and is used as a mother-ship for smaller 'Killer UAVs (KUAV).' The KUAV carries a mission specific set of instruments; it can be a sensor or a warhead or both depending on the desired end results. After the target is acquired by the HUAV, the target information will be transferred to the KUAV. The KUAV can then be launched n close proximity of the target with the target position update from the HUAV. This thesis will focus on the development of a prototype KUAV and the integration of the prototype with the existing HUAV 'Rascal' developed and operated by the Naval Postgraduate School (NPS). The KUAV and the HUAV will form the Tactical UCAV system.
DTIC
Drone Vehicles; Evaluation; Performance Tests; Pilotless Aircraft; Prototypes

20080014486 Naval Postgraduate School, Monterey, CA USA
Force Protection via UGV-UAV Collaboration: Development of Control Law for Vision Based Target Tracking on SUAV
Liang, Lee S; Dec 2007; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475930; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475930

The Naval Postgraduate School UAV Laboratory developed a Small Unmanned Aerial Vehicle (SUAV) equipped with a Vision Based Target Tracking (VBTT) system as part of its Tactical Network Topology field experimentation program. The VBTT system includes a miniaturized gimbaled camera that allows autonomous target tracking while providing concurrent estimates of target motion including its position velocity and heading. Using the current control law the speed of convergence and the range-holding performance have been found to deteriorate as target speed increases. The aim of this thesis is to elaborate on the existing control law in order to achieve better performance. Employing a new and novel algorithm from the Lyapunov Stability Analysis for the purpose of adjusting the feedback gain is proposed in this thesis; to that end a control law with adjustable gain can be easily implemented based on UAV-Target kinematics to optimize UAV performance. The performance of the newly adjustable gain control law is tested in both SIMULINK model and Hardware-In-the-Loop simulations to verify any improvement in performance over the constant gain control law. Principal results offer improved SUAV target-tracking performance with no additional hardware costs.
DTIC
Control Theory; Protection; Remotely Piloted Vehicles; Targets; Tracking (Position)

20080014488 Naval Postgraduate School, Monterey, CA USA
A Methodological Approach for Conducting a Business Case Analysis (BCA) of the Global Observer Joint Capability Technology Demonstration (JCTD)
Dennis, Thiow Y; Lim,; Dec 2007; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475934; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475934

The Global Observer is a Joint Capability Technology Demonstration (JCTD) initiative that is being managed by the USA Special Operations Command (US SOCOM). The JCTD Program seeks to accelerate the development and operational evaluation of mature advanced technologies to rapidly transition the new capability to military operations. The Global Observer is a liquid-hydrogen powered unmanned aircraft system that has been designed for deployment as a stratospheric satellite. It will provide an affordable, persistent presence over any designated area of interest for surveillance and communications relay missions The purpose of this study is to analyze the cost savings, as well as the other benefits associated with the operational deployment of the Global Observer. This thesis will (1) Develop a model for performing business case analyses of JCTDs, including defining the methodical structure required in the business case report; and (2) Conduct the Global Observer JCTD business case analysis, including a baseline analysis and a comprehensive sensitivity analysis based on a developed operational scenario with 6 designated areas of operations, while comparing the performance with an existing analogous system, i.e., the RQ-4 Global Hawk.
DTIC
Artificial Satellites; Commerce; Drone Vehicles; High Altitude; Liquid Hydrogen

20080014489 Naval Postgraduate School, Monterey, CA USA

Potential Logistics Cost Savings from Engine Commonality

Henderson, Robert L; Higer, Matthew W; Dec 2007; 133 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475939; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475939

The purpose of this MBA Project is to determine potential logistics cost savings the USAF and DoD could have realized through the life of the F-16 fighter aircraft had they required engine commonality from the two engine manufacturers during the Alternate Fighter Engine (AFE) competition. Additionally, the authors seek to establish analysis framework to determine potential cost savings from commonality for other complex, high-cost systems (end items or subcomponents). The model assumes inventory consolidation is necessary to realize any savings from commonality. The Ardalan Heuristic Method is employed to determine siting for consolidation points using existing USA Air Force operational locations. This MBA Project determined the potential cost savings for engine commonality in the F-16 to be approximately $31.8M (2006 dollars).

DTIC

Aircraft Engines; Cost Reduction; F-16 Aircraft; Fighter Aircraft; Logistics

20080014507 Naval Postgraduate School, Monterey, CA USA

The Social Networks of Small Arms Proliferation: Mapping an Aviation Enabled Supply Chain

Curwen, Philip A; Dec 2007; 155 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475981; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475981

A complex network of dealers, brokers, financiers, and traffickers continue to funnel large quantities of small arms and ammunition into African conflict zones despite the presence of United Nations arms embargoes. Weapons are often transported from arms producing countries in Eastern Europe and the post-Soviet States to remote locations in Africa by civil aircraft. This thesis will focus on the process by which weapons are bought and sold and the illicit nexus of arms brokerage and transportation networks that facilitate the deadly trade. This supply chain will be presented as the 'anatomy of an arms deal' which can be further described using the statistical tools and measures of social network analysis. Selected case studies of proliferation events into the West African state of Liberia will be used to construct networks that can be compared to the supply chain model and possibly suggest additional points of intervention to halt this deadly trade.

DTIC

Africa; Ammunition; Chains; General Aviation Aircraft; Network Analysis; Networks

20080014518 Naval Postgraduate School, Monterey, CA USA

Business Case Analysis of the Joint Strike Fighter's Alternate Engine Program

Shick, BethAnn; Dec 2007; 81 pp.; In English

Report No.(s): AD-A476012; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476012

The Joint Strike Fighter (JSF) program is the largest Department of Defense (DoD) military aircraft acquisition program to date. The JSF will serve the Air Force, Navy and Marine Corps, as well as many of our key international allies In 1998, the DoD initiated the JSF alternate engine program in an effort to achieve cost savings, performance improvements, and other non-tangible benefits, similar to those achieved during the F-16 Great Engine War Congress has periodically debated the pros and cons of the JSF alternate engine program, coming to no real consensus on the topic. The most recent debate coincided with the FY2007 budget request, which resulted in the proposed cancellation and elimination of funding for the F136 program. While Congress eventually restored the majority of the program's funding for that year, the DoD has again proposed elimination of the program in its FY2008 budget proposal. With a program of this magnitude, the savings and performance benefits to be gained are significant. Before DoD decides to terminate the alternate engine program, a thorough and unbiased analysis should be performed to weigh the costs and benefits of the second engine program. This thesis is a Business Case Analysis (BCA) of the costs, benefits, issues, and effects associated with maintaining the JSF's alternate engine program. It compares the dual-source and sole-source scenarios with regard to the development, production, and life-cycle sustainment of the JSF engine. The study also explores past DoD engine acquisition programs, including the highly successful dual-sourced F-16/F-15 engine, to establish a precedent for the potential monetary and non-monetary savings that can result from competition. Finally, the thesis examines the non-quantitative impacts the program's cancellation will have on the DoD, its allies, and the industrial base.

DTIC

Commerce; Procurement

20080014547 Naval Postgraduate School, Monterey, CA USA

An Analysis of the Benefits and Savings of the Center of Excellence within the Fleet Readiness Centers

Deboe, Philip; Goolsby, John; Dec 2007; 59 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476079; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476079

Recognizing the need to reduce cost, Naval Air Systems Command (NAVAIR) reorganized the Intermediate and Depot level maintenance structures to form the combined Fleet Readiness Center. By combining Intermediate and Depot facilities, NAVAIR can reduce Aviation Depot Level Repairable (AVDLR) costs by interdicting Beyond Capable Maintenance AVDLR's. NAVAIR further consolidated the Naval Aviation Enterprise by creating Centers of Excellence (COE) at designated FRC's to limit the amount of repair sites for particular Weapon Repairable Assemblies. The purpose of this MBA Project is to demonstrate that the COE decreases turn-around-time and drastically reduces AVDLR costs by interdicting BCM AVDLR's. This project provides a comprehensive overview of efficiencies and cost savings gained by FRC West's APG-65/73 radar system COE. This project utilizes Arena Software creating a model that better quantifies the benefits of the COE maintenance structure. In addition to demonstrating efficiencies, this project highlights potential detractors that could cause the COE to fall short of its intended goals of better efficiency and cost savings realization. This project was sponsored by FRC West, located in Lemoore, CA. The results identified by this project focus on FRC West, however, they can be generalized and be made applicable throughout the Naval Aviation Enterprise.

DTIC

Cost Analysis; Cost Effectiveness; Maintenance; Shops

20080014652 Congressional Budget Office, Washington, DC USA

The Air Force's Proposal for Procuring F-22 Fighters

Marron, Donald B; Mar 28, 2006; 12 pp.; In English

Report No.(s): AD-A476117; No Copyright; Avail.: Defense Technical Information Center (DTIC)

I am pleased to appear before you today to discuss the Air Force's acquisition strategy for the F-22 fighter program. At your request, the Congressional Budget Office (CBO) has examined the proposal for a multiyear procurement contract for 60 aircraft.

DTIC

Armed Forces (United States); F-22 Aircraft; Federal Budgets; Fighter Aircraft; Government Procurement; Procurement

20080014655 Sydney Univ., Australia

Cooperative Airborne Inertial-SLAM for Improved Platform and Feature/Target Localisation

Sukkarieh, Salah; Bryson, Mitch; Jan 25, 2008; 24 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA5209-05-P-0550

Report No.(s): AD-A476125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The aim of this project is to develop cooperative guidance laws for platforms which employ Simultaneous Localization and Mapping (SLAM) algorithms as part of the information feedback to the guidance loop. In GPS denied environments SLAM is an essential navigation tool, as it can provide both a map of ground features together with location and attitude information for the sensor platform with respect to this map. The benefit of using the SLAM algorithm is that it can determine the accuracy of both platform and target locations, both of which improve as a function of feature/target revisitation or sharing of maps between various platforms

DTIC

Autonomous Navigation; Drone Vehicles; Multisensor Fusion; Position (Location); Supersonic Low Altitude Missile; Targets

20080014664 Library of Congress, Washington, DC USA

National Aviation Security Policy, Strategy, and Mode-Specific Plans: Background and Considerations for Congress

Elias, Bart; Jan 2, 2008; 28 pp.; In English

Report No.(s): AD-A476141; CRS-RL34302; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the years leading up to the terrorist attacks of September 11, 2001, the USA lacked a comprehensive national policy and strategy for aviation security. The approach to aviation security was largely shaped by past events, such as the bombing of Pan Am flight 103 in December 1988, rather than a comprehensive evaluation of the full range of security risks. The 9/11 Commission concluded that the terrorist attacks of September 11, 2001 revealed failures of imagination, policy, capabilities, and management by both the FAA and the U.S. intelligence community. Following the September 11, 2001 attacks, U.S.

aviation security policy and strategy was closely linked to the changes called for in the Aviation and Transportation Security Act (ATSA, P.L. 107-71), which emphasized sweeping changes to the security of passenger airline operations. While the importance of strategic planning was recognized, it was not a priority. The 9/11 Commission Report concluded that the TSA had failed to develop an integrated strategy for the transportation sector and mode specific plans, prompting Congress to mandate the development of these strategies and plans in the Intelligence Reform and Terrorism Prevention Act of 2004 (P.L. 108-458). While the TSA has developed these strategies and plans, the documents have been considered security sensitive thus limiting public discourse on the DHS strategy for aviation security. However, in June 2006 President Bush directed the DHS to establish and implement a national strategy for aviation security and an accompanying set of supporting plans.
DTIC
Airline Operations; Commercial Aircraft; Military Operations; Planning; Policies; Security

20080014689 Air Command and Staff Coll., Maxwell AFB, AL USA
Back to the Basics: An Aviation Solution to Counter-Insurgent Warfare
Davis, Arthur D; Apr 2005; 46 pp.; In English
Report No.(s): AD-A476254; AU/ACSC/3776/2005-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study focuses on the current War on Terrorism as a conflict against insurgents attacking U.S. power wherever it shows itself through asymmetric means. The primary targets of late have been military and civilian convoy operations in Iraq and, to some extent, Afghanistan. By examining past examples of the use of air power in counterinsurgent warfare, this study will shed light on current failings in both U.S. equipment and doctrine in waging this type of war. The French used low-technology aircraft in Algeria to attack insurgent forces and defend ground troops. The aircraft that were employed were World War II-vintage T-6 and A-1 fighters that proved well adapted to the environment. These aircraft, and the manner in which they were deployed and employed, made the difference in containing and defeating the insurgents. In Vietnam, the USA employed T-28 and A-1 aircraft, as they were ideally suited to training the South Vietnamese Air Force and had a proven track record in this type of war. The USA should re-think its inventory of aircraft devoted to counterinsurgent war by looking at possible replacements for the A-1. This should be accompanied by a re-evaluation of the manner in which these assets are employed by having them located with the ground forces they are meant to support.
DTIC
Algeria; Propellers; Vietnam; Warfare

20080014796 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Dryden Status
Cox, Timothy H.; March 05, 2008; 8 pp.; In English; SAE Aerospace Control and Guidance Sub-Committee, 5-7 Mar. 2008, Lake City, UT, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014796

This viewgraph document reviews the status of several Dryden projects. They are: the Ikhana Project, development of the F-15 Intelligent Flight Control System, the development of a C-20A Precision Autopilot for use in Unmanned Aerial Vehicle Synthetic Aperture Radar (UAVSAR), the development of the X-48B Blended Wing Body aircraft, and development of Stratospheric Observatory for Infrared Astronomy (SOFIA).
CASI
Project Management; Systems Engineering; Aircraft Design; Research and Development; Progress; NASA Programs; Aircraft Configurations; Aerodynamic Configurations; Aeronautical Engineering

20080014868 NASA Dryden Flight Research Facility, Edwards, CA, USA
DARPA/USAF/USN J-UCAS X-45A System Demonstration Program: A Review of Flight Test Site Processes and Personnel
Cosentino, Gary B.; March 12, 2008; 17 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014868

The Joint Unmanned Combat Air Systems (J-UCAS) program is a collaborative effort between the Defense Advanced Research Project Agency (DARPA), the US Air Force (USAF) and the US Navy (USN). Together they have reviewed X-45A flight test site processes and personnel as part of a system demonstration program for the UCAV-ATD Flight Test Program.

The goal was to provide a disciplined controlled process for system integration and testing and demonstration flight tests. NASA's Dryden Flight Research Center (DFRC) acted as the project manager during this effort and was tasked with the responsibilities of range and ground safety, the provision of flight test support and infrastructure and the monitoring of technical and engineering tasks. DFRC also contributed their engineering knowledge through their contributions in the areas of autonomous ground taxi control development, structural dynamics testing and analysis and the provision of other flight test support including telemetry data, tracking radars, and communications and control support equipment. The Air Force Flight Test Center acted at the Deputy Project Manager in this effort and was responsible for the provision of system safety support and airfield management and air traffic control services, among other supporting roles. The T-33 served as a J-UCAS surrogate aircraft and demonstrated flight characteristics similar to that of the the X-45A. The surrogate served as a significant risk reduction resource providing mission planning verification, range safety mission assessment and team training, among other contributions.
Derived from text
Flight Tests; Unmanned Aircraft Systems; X-45 Aircraft; Aerospace Safety; Aerospace Engineering; Flight Operations

20080015369 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD USA
A Survey of Parachute Ankle Brace Breakages
Knapik, Joseph J; Spiess, Anita; Darakjy, Salima; Grier, Tyson; Manning, Fred; Livingston, Elaine; Swedler, David; Amoroso, Paul; Jones, Bruce H; Jan 10, 2008; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475904; USACHPPM-12-MA01Q2-08B; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475904

A questionnaire was administered to 1,956 students in Army Airborne training as part of an effort by the Military Training Task Force (MTTF) of the Defense Safety Oversight Council (DSOC) to evaluate the parachute ankle brace (PAB). Information provided by the questionnaire identified potential injury risk factors and comments on the PAB. Risk factors for injuries in the past year included service branch, Airborne recycling, less physical activity, older age, greater body weight, higher BMI, and (among Army personnel) slower 2-mile run time. Risk factors for jump week injuries included higher rank, longer time in service, older age, Airborne recycling, height, more body weight, not wearing the PAB, aircraft exit problems, an injury in the past year, and (for Army men) fewer push-ups and slower 2-mile run time. Students who had worn the brace were more likely to have favorable comments on the PAB compared with those who had not worn it. Most negative PAB comments were related to the heel strap and an improvement has been proposed and is in production. Students complained that the PAB rubbed on the legs, shin, ankle, and calf; this might be associated with the heel strap or pulling the ankle strap to tight; this problem might be alleviated by the strap improvement and/or better guidance on appropriate tightness for the ankle straps. Students also complained of difficulty in keeping the feet and knees together when wearing the PAB. This could be a matter of perception or some adaptation and accommodation may be required in this area.
DTIC
Education; Injuries; Parachutes; Supports; Surveys

20080015406 Naval Aviation Schools Command, Pensacola, FL USA
Initial, Cockpit Anthropometric Assessment of U.S. Navy T-6 Life Support Equipment
Hunt, James C; Nov 5, 2007; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476097; NASC/TR-2007/1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to conduct an initial anthropometric cockpit assessment of proposed modifications to T-6 aircrew survival equipment in order to identify potential restrictions or interference with cockpit functions. The participants represented each Joint Primary Aviation Training System (JPATS) anthropometric Cases, 1 through 7. Methods. Seven flight students at Naval Aviation Schools Command were selected as Test Cases JPATS anthropometric dimensions by nearest Sitting Height (SH), Buttock-Knee Length (BKL), and Thumb-Tip Reach (TTR). Each Test Case was outfitted with Navy engineering change proposal student configuration of life support gear. Each subject's accommodation was evaluated in both cockpits: internal field of view (FOV), external over the nose (OTN) vision, reach to controls, overhead clearance, and safe ejection posture. Insufficient reach capabilities were measured to landing gear handle, emergency landing gear handle, parking brake handle, and some lower central main instrument panel switches with locked harness, with and without stretching shoulder and arm muscles against the restraint, and in two cases, unlocked harness at full payout. Inability to affect forward left control stick was also measured. Major findings. Proposed student life support gear configuration was compatible for anthropometric Test Cases 1 through 7. But during simultaneous multivariate dimension interaction for normal and emergency functionality and

immediate ejection safety, the T-6A didn't filly (safely) accommodate the fill spectrum of anthropometric cases. Results. Test Case 1, small, was not able to reach landing gear, emergency landing gear, and parking brake handles, or affect forward left stick, even with unlocked harness. Test Case 7, overall small, was taller in SH than JPATS Case 7 and was not able to reach landing gear, emergency landing gear and parking brake while stretching against locked harness, despite adjusting the seat down from full up.
DTIC
Anthropometry; Cockpits; Life Support Systems; Multivariate Statistical Analysis; Navy

20080015489 Air Force Research Lab., Wright-Patterson AFB, OH USA
Computational Nonlinear Aeroelasticity
Beran, Philip S; Snyder, Richard D; Jan 2008; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A03L
Report No.(s): AD-A475830; AFRL-RB-WP-TR-2008-3024; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475830
This report documents the culmination of in-house work in the area of computational modeling techniques for aeroelasticity. At the project onset, emphasis was given to the challenge of predicting flutter points for aircraft in the transonic regime. Methods based on bifurcation theory and reduced order modeling were developed and tested. This work helped to shape the activity of the aeroelastic community, and an international workshop in the subject area to be held in 2008 testifies to this achievement. Attention then turned to studying vehicles that might experience large structural deformations, such as high-altitude vehicles. Finally, computational methods have been investigated for the exploitation of aeroelastic interactions in the design of micro-air vehicles.
DTIC
Aeroelasticity; Nonlinearity

20080015614 Air Force Research Lab., Wright-Patterson AFB, OH USA
Composites Affordability Initiative (Preprint)
Russell, John D; Aug 2007; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-3-5103; Proj-2865
Report No.(s): AD-A476134; AFRL-RX-WP-TP-2008-4005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
In the mid 1990's, the USA Air Force Research Laboratory (AFRL) recognized that despite the potential of advanced composites to drastically reduce aircraft structural weights compared to conventional metal structures, the aircraft industry was reluctant to implement them in new aircraft. As a result, AFRL launched the Composites Affordability Initiative (CAI) to address these concerns. CAI found that the key to affordability in composites was to reduce assembly costs through the integration of parts and by bonding parts, structural assembly costs could be drastically reduced. As a result, CAI's objective was to establish the confidence to fly large integrated and bonded structures. A partnership between AFRL, the Office of Naval Research, Bell Helicopter, Boeing, Lockheed Martin, and Northrop Grumman was established to develop technologies to meet this objective. This initiative required a multidisciplinary approach: maturation of materials and processes, an understanding of the structural behavior of bonded joints, quality assurance and nondestructive evaluation to ensure bonded joints remain bonded throughout an aircraft's service life, and the buy off of U.S. Department of Defense (DoD) aircraft certification authorities. An assessment will be provided of the technical achievements, technology transition successes and failures, and the program structure and teaming arrangements.
DTIC
Aircraft; Bonded Joints; Composite Materials; Computer Assisted Instruction

20080015665 NASA Ames Research Center, Moffett Field, CA, USA; NASA Ames Research Center, Moffett Field, CA, USA
The Aviation System Monitoring and Modeling (ASMM) Project: A Documentation of its History and Accomplishments: 1999-2005
June 2007; 264 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 457280.02.07.01.07
Report No.(s): NASA/TP-2007-214556; A-070003; Copyright; Avail.: CASI: A12, Hardcopy
The Aviation System Monitoring and Modeling (ASMM) Project was one of the projects within NASA s Aviation Safety

Program from 1999 through 2005. The objective of the ASMM Project was to develop the technologies to enable the aviation industry to undertake a proactive approach to the management of its system-wide safety risks. The ASMM Project entailed four interdependent elements: (1) Data Analysis Tools Development - develop tools to convert numerical and textual data into information; (2) Intramural Monitoring - test and evaluate the data analysis tools in operational environments; (3) Extramural Monitoring - gain insight into the aviation system performance by surveying its front-line operators; and (4) Modeling and Simulations - provide reliable predictions of the system-wide hazards, their causal factors, and their operational risks that may result from the introduction of new technologies, new procedures, or new operational concepts. This report is a documentation of the history of this highly successful project and of its many accomplishments and contributions to improved safety of the aviation system.
Author
Aircraft Safety; Flight Safety; Systems Engineering; Safety Factors; Risk; Hazards; Aircraft Industry

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.

20080015400 NASA Glenn Research Center, Cleveland, OH, USA
An Object-oriented Computer Code for Aircraft Engine Weight Estimation
Tong, Michael T.; Naylor, Bret A.; June 09, 2008; 7 pp.; In English; Proceedings of ASME Turbo Expo 2008: Power for Land, Sea and Air, 9-13 Jun. 2008, Berlin, Germany; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.13.03
Report No.(s): GT2008-50062; Copyright; Avail.: Other Sources

Reliable engine-weight estimation at the conceptual design stage is critical to the development of new aircraft engines. It helps to identify the best engine concept amongst several candidates. At NASA Glenn (GRC), the Weight Analysis of Turbine Engines (WATE) computer code, originally developed by Boeing Aircraft, has been used to estimate the engine weight of various conceptual engine designs. The code, written in FORTRAN, was originally developed for NASA in 1979. Since then, substantial improvements have been made to the code to improve the weight calculations for most of the engine components. Most recently, to improve the maintainability and extensibility of WATE, the FORTRAN code has been converted into an object-oriented version. The conversion was done within the NASA s NPSS (Numerical Propulsion System Simulation) framework. This enables WATE to interact seamlessly with the thermodynamic cycle model which provides component flow data such as airflows, temperatures, and pressures, etc. that are required for sizing the components and weight calculations. The tighter integration between the NPSS and WATE would greatly enhance system-level analysis and optimization capabilities. It also would facilitate the enhancement of the WATE code for next-generation aircraft and space propulsion systems. In this paper, the architecture of the object-oriented WATE code (or WATE++) is described. Both the FORTRAN and object-oriented versions of the code are employed to compute the dimensions and weight of a 300- passenger aircraft engine (GE90 class). Both versions of the code produce essentially identical results as should be the case. Keywords: NASA, aircraft engine, weight, object-oriented
Author
Object-Oriented Programming; Turbine Engines; Weight Analysis; Engine Design; Computer Programs; Thermodynamic Cycles; Propulsion System Configurations; Applications Programs (Computers); Air Flow

20080015508 NASA Glenn Research Center, Cleveland, OH, USA
Mixing of Multiple Jets with a Confined Subsonic Crossflow: Part III--The Effects of Air Preheat and Number of Orifices on Flow and Emissions in an RQL Mixing Section
Holdemann, James D.; Chang, Clarence T.; March 2008; 28 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC3-412; WBS 984754.02.07.03.19.04
Report No.(s): NASA/TM-2008-215151; E-16378; Copyright; Avail.: CASI: A03, Hardcopy

This study was motivated by a goal to understand the mixing and emissions in the Rich-burn/Quick-mix/Lean-burn (RQL) combustor scheme that has been proposed to minimize the formation of oxides of nitrogen (NOx) in gas turbine combustors. The study reported herein was a reacting jet-in-crossflow experiment at atmospheric pressure. The jets were injected from the

perimeter of a cylindrical duct through round-hole orifices into a fuel-rich mainstream flow. The number of orifices investigated in this study gave over- to optimum to underpenetrating jets at a jet-to-mainstream momentum-flux ratio of J = 57. The size of individual orifices was decreased as the number of orifices increased to maintain a constant total area; the jet-to-mainstream mass-flow ratio was constant at MR = 2.5. The experiments focused on the effects of the number of orifices and inlet air preheat and were conducted in a facility that provided the capability for independent variation of jet and main inlet air preheat temperature. The number of orifices was found to have a significant effect on mixing and the distributions of species, but very little effect on overall NOx emissions, suggesting that an aerodynamically optimum mixer might not minimize NOx emissions. Air preheat was found to have very little effect on mixing and the distributions of major species, but preheating both main and jet air did increase NOx emissions significantly. Although the air jets injected in the quick-mix section of an RQL combustor may comprise over 70 percent of the total air flow, the overall NOx emission levels were found to be more sensitive to main stream air preheat than to jet stream air preheat.
Author
Air Jets; Air Flow; Cross Flow; Gas Turbines; Exhaust Emission; Exhaust Gases; Combustion Chambers; Fuel Flow; Mixers

20080015509 NASA Glenn Research Center, Cleveland, OH, USA
Operability of an Ejector Enhanced Pulse Combustor in a Gas Turbine Environment
Paxson, Daniel E.; Dougherty, Kevin; March 2008; 24 pp.; In English; 46th Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.17.02
Report No.(s): NASA/TM-2008-215169; AIAA Paper 2008-0119; E-16410; Copyright; Avail.: CASI: A03, Hardcopy

A pressure-gain combustor comprised of a mechanically valved, liquid fueled pulsejet, an ejector, and an enclosing shroud, was coupled to a small automotive turbocharger to form a self-aspirating, thrust producing gas turbine engine. The system was constructed in order to investigate issues associated with the interaction of pulsed combustion devices and turbomachinery. Installed instrumentation allowed for sensing of distributed low frequency pressure and temperature, high frequency pressure in the shroud, fuel flow rate, rotational speed, thrust, and laboratory noise. The engine ran successfully and reliably, achieving a sustained thrust of 5 to 6 lbf, and maintaining a rotor speed of approximately 90,000 rpm, with a combustor pressure gain of approximately 4 percent. Numerical simulations of the system without pressure-gain combustion indicated that the turbocharger would not operate. Thus, the new combustor represented a substantial improvement in system performance. Acoustic measurements in the shroud and laboratory indicated turbine stage sound pressure level attenuation of 20 dB. This is consistent with published results from detonative combustion experiments. As expected, the mechanical reed valves suffered considerable damage under the higher pressure and thermal loading characteristics of this system. This result underscores the need for development of more robust valve systems for this application. The efficiency of the turbomachinery components did not appear to be significantly affected by unsteadiness associated with pulsed combustion, though the steady component efficiencies were already low, and thus not expected to be particularly sensitive.
Author
Turbocompressors; Combustion Chambers; Gas Turbine Engines; Pulsejet Engines; Turbomachinery; Low Frequencies; Fuel Flow; Thrust; Acoustic Measurement

20080015546 NASA Glenn Research Center, Cleveland, OH, USA
Post Test Evaluation of HSCT Nozzle Acoustic Liner Subcomponents Subjected to a Hot Acoustic Durability Test
Verrilli, Michael J.; Lee, Kuan; March 2008; 50 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.03.11.03
Report No.(s): NASA/TM--2008-215015; E-16184; HSR075; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015546

The acoustic liner system designed for use in the High Speed Civil Transport (HSCT) was tested in a thermal-acoustic environment. Five ceramic matrix composite (CMC) acoustic tile configurations, five bulk acoustic absorbers, and one thermal protection system design were tested. The CMC acoustic tiles were subjected to two 2 3/4 hr ambient temperature acoustic exposures to measure their dynamic response. One exposure was conducted on the tiles alone and the second exposure included the tiles and the T-foam bulk absorber. The measured tile RMS strains were small. With or without the T-foam absorber, the dynamic strains were below strain levels that would cause damage during fatigue loading. After the ambient exposure, a 75-hr durability test of the entire acoustic liner system was conducted using a thermal-acoustic cycle that approximated the anticipated service cycle. Acoustic loads up to 139 dB/Hz and temperatures up to 1670 F (910 C) were employed during this 60 cycle test. During the durability test, the CMC tiles were exposed to temperatures up to 1780 F and a transient through thickness gradient up to 490 F. The TPS peak temperatures on the hot side of the panels ranged from 750

to 1000 F during the 60 cycles. The through thickness delta T ranged from 450 to 650 F, varying with TPS location and cycle number. No damage, such as cracks or chipping, was observed in the CMC tiles after completion of the testing. However, on tile warped during the durability test and was replaced after 43 or 60 cycles. No externally observed damage was found in this tile. No failure of the CMC fasteners occurred, but damage was observed. Cracks and missing material occurred, only in the fastener head region. No indication of damage was observed in the T-foam acoustic absorbers. The SiC foam acoustic absorber experienced damage after about 43 cycles. Cracking in the TPS occurred around the attachment holes and under a vent. In spite of the development of damage, the TPS maintained its insulative capability throughout the durability test. The durability test results demonstrate damage-tolerant CMC tile, CMC fastener, TPS, and T-foam absorber designs for the combined thermal and acoustic engine nozzle environment.
Author
Acoustic Nozzles; Thermal Protection; Ceramic Matrix Composites; Tiles; Linings; Dynamic Response; Systems Engineering

08
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.

20080015499 Florida Univ., Gainesville, FL, USA; NASA Langley Research Center, Hampton, VA, USA
Modeling and Inverse Controller Design for an Unmanned Aerial Vehicle Based on the Self-Organizing Map
Cho, Jeongho; Principe, Jose C.; Erdogmus, Deniz; Motter, Mark A.; [2005]; 13 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 463; NAG1-02068; Copyright; Avail.: CASI: A03, Hardcopy

The next generation of aircraft will have dynamics that vary considerably over the operating regime. A single controller will have difficulty to meet the design specifications. In this paper, a SOM-based local linear modeling scheme of an unmanned aerial vehicle (UAV) is developed to design a set of inverse controllers. The SOM selects the operating regime depending only on the embedded output space information and avoids normalization of the input data. Each local linear model is associated with a linear controller, which is easy to design. Switching of the controllers is done synchronously with the active local linear model that tracks the different operating conditions. The proposed multiple modeling and control strategy has been successfully tested in a simulator that models the LoFLYTE UAV.
Author
Control Systems Design; Controllers; Pilotless Aircraft; Mathematical Models; Aircraft Design

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*.

20080014416 Naval Postgraduate School, Monterey, CA USA
A Managerial Approach to NASA's Cultural Changes: Open System Model
Aytekin, Yasin; Long, Nicholas; Dec 2007; 139 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475773; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475773

This project describes NASA's culture during two important time periods (1958-1972) and (1996-2004) and explains its relative fit with its system components -- task, people, resources, and structure. The open-system model is used to explain how system components affect culture and how culture affects them. During the first period (1958-1972), NASA was established and it landed the first man on the moon, a remarkable accomplishment given the advances in science and technology required to complete this mission. During the second period (1996-2004), the Columbia accident occurred, causing NASA's image to be tarnished and its credibility with key stakeholders to be compromised. To conduct this research, books, online resources, newspaper article, technical and investigative reports and theses provided the main sources of information. Project results indicate that culture alone is not the only contributory factor to NASA's performance. The space agency's technical culture closely aligned with system components enabled the organization to complete its moon-landing mission. However, NASA

culture changed due to alterations in the system components. A misalignment between culture and its system components occurred during the second period, causing the Columbia accident. Therefore, the alignment between culture and other components is essential for NASA to perform its missions effectively. NASA leadership should monitor and assess this alignment to help prevent future mishaps.
DTIC
NASA Programs

20080014830 NASA Johnson Space Center, Houston, TX, USA
Space Debris Symposium (A6.) Measurements and Space Surveillance (1.): Measurements of the Small Particle Debris Cloud from the 11 January, 2007 Chinese Anti-satellite Test
Matney, Mark J.; Stansbery, Eugene; J.-C Liou; Stokely, Christopher; Horstman, Matthew; Whitlock, David; [2008]; 2 pp.; In English; International Astronautical Federation Meeting, 29 Sept. - 3 Oct. 2008, Glasgow, UK; Copyright; Avail.: Other Sources; Abstract Only

On January 11, 2007, the Chinese military conducted a test of an anti-satellite (ASAT) system, destroying their own Fengyun-1C spacecraft with an interceptor missile. The resulting hypervelocity collision created an unprecedented number of tracked debris - more than 2500 objects. These objects represent only those large enough for the US Space Surveillance Network (SSN) to track - typically objects larger than about 5-10 cm in diameter. There are expected to be even more debris objects at sizes too small to be seen and tracked by the SSN. Because of the altitude of the target satellite (865 x 845 km orbit), many of the debris are expected to have long orbital lifetimes and contribute to the orbital debris environment for decades to come. In the days and weeks following the ASAT test, NASA was able to use Lincoln Laboratory s Haystack radar on several occasions to observe portions of the ASAT debris cloud. Haystack has the capability of detecting objects down to less than one centimeter in diameter, and a large number of centimeter-sized particles corresponding to the ASAT cloud were clearly seen in the data. While Haystack cannot track these objects, the statistical sampling procedures NASA uses can give an accurate statistical picture of the characteristics of the debris from a breakup event. For years computer models based on data from ground hypervelocity collision tests (e.g., the SOCIT test) and orbital collision experiments (e.g., the P-78 and Delta-180 on-orbit collisions) have been used to predict the extent and characteristics of such hypervelocity collision debris clouds, but until now there have not been good ways to verify these models in the centimeter size regime. It is believed that unplanned collisions of objects in space similar to ASAT tests will drive the long-term future evolution of the debris environment in near-Earth space. Therefore, the Chinese ASAT test provides an excellent opportunity to test the models used to predict the future debris environment. For this study, Haystack detection events are compared to model predictions to test the model assumptions, including debris size distribution, velocity distribution, and assumptions about momentum transfer between the target and interceptor. In this paper we will present the results of these and other measurements on the size and extent of collisional breakup debris clouds.
Author
Space Debris; Space Surveillance (Spaceborne); Astronautics; Chinese Spacecraft; Antimissile Defense

13
ASTRODYNAMICS

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

20080014499 Naval Postgraduate School, Monterey, CA USA
On the Calculation of Particle Trajectories from Sea Surface Current Measurements and Their Use in Satellite Sea Surface Products off the Central California Coast
Spence, Luke J; Dec 2007; 88 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475962; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475962

This thesis explores the possibility and feasibility of improving existing satellite measurements of sea surface temperature (SST) by the incorporation of high-frequency (HF) radar-derived surface current data. Water parcels tagged with SST are advected using particle trajectories calculated by integrating surface current velocity data. The SST of these advected water parcels are compared to SST measurements at the final times and locations of the advected water parcels. Different methods of generating surface currents from HF radar measurements are also examined. The Totals current method is a local fitting method which generates surface current measurements by solving a least-squares equation fitting multiple measurements from different radar sites. The Open-boundary Modal Analysis (OMA) method is a global method which fits a series of

eigenfunction modes to available radial measurements. These modes are generated by solving two Laplacian eigenvalue problems on the domain with Dirichlet and Neumann boundary conditions, and adding a set of boundary modes to account for flow accross open boundaries. Any current field in the domain can be described using a combination of these modes. The two methods are compared for accuracy against an analytic solution to the linear Stommel problem.
DTIC
Artificial Satellites; Coasts; Ocean Currents; Ocean Surface; Particle Trajectories; Trajectories

20080015615 CFD Research Corp., Huntsville, AL USA
Unified Kinetic Approach for Simulation of Gas Flows in Rarefied and Continuum Regimes
Kolobov, Vladimir; Arslanbekov, Robert; Bayyuk, Sami; Aristov, Vladimir; Frolova, Anna; Zabelok, Sergey; Tcheremissine, Filix; Jun 2007; 92 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-04-C-3404; Proj-A02W
Report No.(s): AD-A476170; CFD-8572-F; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report was developed under a SBIR contract. The objective of this effort was to develop a computation fluid dynamics tool for air and space flight. Flow fields characterized by the simultaneous presence of continuum and rarefied regimes arise in many important applications, ranging from re-entry of aerospace vehicles to micro-fluidics. In this Phase II SBIR Project, we have developed a Unified Flow Solver with adaptive mesh and algorithm refinement based on direct numerical solution of the Boltzmann equation coupled to kinetic schemes of gas dynamics. Our strategy allowed easy coupling of the continuum and Boltzmann solvers in a hybrid code with automatic domain decomposition. We have demonstrated the UFS capabilities for several one-component gas flows and have confirmed that the hybrid method results in significant savings by limiting expensive kinetic solutions only to the regions where they are needed. The UFS could automatically introduce or remove kinetic patches to maximize accuracy and efficiency of simulations. We have extended UFS to molecular gases with rotationally and vibrationally degrees of freedom and to multi-component reactive gas mixtures. It was demonstrated that the UFS methodology could provide an efficient solution to practical problems of polyatomic gas mixtures of different degrees of rarefaction.
DTIC
Atmospheric Entry; Computational Fluid Dynamics; Continuums; Gas Flow; Rarefied Gas Dynamics; Simulation

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*.

20080014485 Naval Postgraduate School, Monterey, CA USA
Distributed Autonomous Control of Multiple Spacecraft During Close Proximity Operations
McCamish, Shawn B; Dec 2007; 281 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475928; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475928

This research contributes to multiple spacecraft control by developing an autonomous distributed control algorithm for close proximity operations of multiple spacecraft systems, including rendezvous and docking scenarios. The proposed control algorithm combines the efficiency of the Linear Quadratic Regulator (LQR) and the robust collision avoidance capability of the Artificial Potential Function (APF) method. The LQR control effort serves as the attractive force toward goal positions, while the APF-based repulsive functions provide collision avoidance for both fixed and moving obstacles. The combination of the LQR and APF control logics, referred to as the LQR/APF control algorithm, yielded promising results as demonstrated by the numerous multiple spacecraft maneuver simulations reported in this dissertation. In order to validate the proposed control approach, a multiple spacecraft model validation and visualization technique was developed using a versatile MATLAB- Satellite Toll Kit (STK) interface to propagate the spacecraft models, compare against STK generated ephemeris, and animate for analysis The MATLAB-STK interface efficacy was demonstrated during the evaluation and analysis of the innovative LQR/APF multiple spacecraft control algorithm. The LQR/APF multiple spacecraft close proximity control algorithm was developed, refined, and thoroughly simulated using high fidelity six Degree of Freedom (DOF) spacecraft models. In order to evaluate the stability and robustness of the control approach a Monte-Carlo simulations set was run. The LQR/APF control algorithm was further evaluated by virtual hardware-in-the-loop implementation at the NPS Spacecraft

Robotics Laboratory. The laboratory hosts the Autonomous Docking and Spacecraft Servicing testbed which allows for on-the-ground testing of close proximity multiple spacecraft control concepts.
DTIC
Active Control; Automatic Control; Autonomous Navigation; Autonomy; Distributed Parameter Systems; Rendezvous Spacecraft; Spacecraft Control

20080014671 National Central Univ., Chung-Li, Taiwan, Province of China
Study of Equatorial Ionospheric Irregularities with ROCSAT-1/IPEI Data for Assessment of Impacts of Communication/Navigation System (IV)
Liu, Chao H; Su, Shin-Yi; May 31, 2007; 22 pp.; In English
Report No.(s): AD-A476176; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Monthly variation of global equatorial density irregularity distribution has been obtained with data taken by ROCSAT-1 at the 600 km topside ionosphere from March 1999 to June 2004 during high to moderate solar activity periods. This complete global longitudinal distribution of monthly equatorial density irregularity occurrence variation provides not only the best spatial/temporal distribution existed so far but also fills the large gap of irregularity distribution missing over some Pacific regions where few ground observation is available. The 5-1/2 year result of the monthly occurrence pattern indicates a smooth variation across longitudes contrary to some beliefs that a drastic change in irregularity occurrence pattern can occur across some longitudes in the Pacific. Excellent agreement is noted for the current results with Aarons' conjectured sketch of global scintillation occurrence distributions [1993]. Furthermore, the seasonal/longitudinal (s/l) variations of quiet-time post-sunset vertical drift velocities are found to track closely with the s/l variations of irregularity occurrences except during the September equinox season. Linear regression analysis between the vertical drift velocity and the irregularity occurrence rate has been carried out to study the correlation between the two in seasonal as well as longitudinal variation. The results indicate that the vertical drift velocities at three different longitude regions of different magnetic declinations have good correlations with irregularity occurrences for all seasons. This implies that the vertical drift velocity alone can drive the occurrences of equatorial density irregularities in proportion even though its effectiveness has longitudinal variation.
DTIC
Artificial Satellites; Communication Equipment; Equatorial Regions; Ionospheric Disturbances; Irregularities; Navigation

20080014682 Air Force Research Lab., Kirkland AFB, NM USA
Noise Transmission Studies of an Advanced Grid-Stiffened Composite Fairing
Lane, Steven A; Kennedy, Scott; Richard, Robert; Oct 2007; 10 pp.; In English
Report No.(s): AD-A476215; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Interior fairing noise is an important consideration for payload launch survivability and has been studied extensively since the beginning of the space program. This work presents acoustic transmission studies conducted by the Air Force Research Laboratory, Space Vehicles Directorate, on a composite, grid-stiffened, Minotaur payload fairing. These tests were performed in an acoustics laboratory and examined the effects of acoustic flanking paths, the thermal protection system, and melamine-type acoustic blanket treatments on fairing noise. The data showed that acoustic flanking paths significantly increase noise transmission, especially at low frequency. The bare fairing with thermal protection system provided approximately 14 dB of noise reduction over the 5000 Hz bandwidth relative to external levels. Acoustic blanket performance was measured as a function of bandwidth, surface area coverage, and mass. It was observed that small amounts of treatment (2 kg) significantly increased noise reduction (3.6 dB), even at low frequency.
DTIC
Fairings; Launch Vehicles; Noise Reduction; Sound Transmission

20080014683 CSA Engineering, Inc., Albuquerque, NM USA
Synchronous Deployed Solar Sail Subsystem Design Concept
Banik, Jeremy A; Murphey, Thomas W; Apr 2007; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476222; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A solar sail concept has been developed from a common spiral fold pattern in order to enable a simultaneous mast and sail deployment. This novel concept utilizes the stored strain energy in a series of elastic spar members to enforce proper folding kinematics rather than relying on bulky mechanical joints. The critical inner and outer spar networks are secured to four elastically extendible masts anchored to a central drum. Deployment of the solar sail system is actuated by rotating the central drum around which the masts, spars, and film are wrapped. Tensioned radial cords deterministically unfold the

membrane film under the authority of the resilient, spring-like spar members. Proper elastic behavior of the spars is an important facet to this design, and thus a significant effort was dedicated their development. This compact ground demonstration concept includes about 7.5 m2 of reflective membrane film for useful propulsion. Features of this robust, lightweight membrane structure may prove valuable to reducing mass and increasing deployment reliability of other planar subsystems such as sun shades, solar arrays, radiators, or antenna arrays.
DTIC
Deployment; Elastic Properties; Solar Sails

20080014692 CSA Engineering, Inc., Albuquerque, NM USA
Experimental and Numerical Analysis of a DECSMAR Structure's Deployment and Deployed Performance
Pollard, Eric L; Murphey, Thomas W; Sanford, Gregory E; Apr 2007; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476284; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this research is to analyze the deployment and deployed performance of a recently developed, self-deployable truss architecture composed of carbon fiber reinforced plastic (CFRP) tape-spring elements and embedded shape memory alloy (SMA) flexures; this particular structural system is referred to as deployable elastic composite shape memory alloy reinforced (DECSMAR) and is representative of a concentrated, material deformation based deployable architecture. The scope of this study encompasses numerically and experimentally mapping the force profile through the deployment path of a 450 mm radius DECSMAR boom and then to numerically determine the effective continuum, deployed stiffness and strength properties, i.e., bending, shear, torsion, and axial moduli with corresponding critical loads, correlated to experimental analysis, of an equivalent radius, five-bay DECSMAR boom. Minimum deployment force to linear mass and bending modulus to linear mass ratios were measured at 2.79 Nmkg-1 and 2.38 MNm3kg-1, respectively. Of particular interest were deleterious effects of the deployment sequencer on the force profile, the deployed performance attributable to the SMA flexure features, and consequences of flattening longeron ends to buy packaging efficiency. Developmental aspects of the DECSMAR architecture, including the design space of the individual CFRP tape-spring element, an exercise for a point design of a 180 mm radius DECSMAR boom with correlation to experimental analysis, and performance implications of scaling the truss radius, are focused on in a prequel manuscript.
DTIC
Deployment; Numerical Analysis; Shape Memory Alloys; Spacecraft Components; Structural Analysis; Trusses

20080014699 Michigan Univ., Ann Arbor, MI USA
Nonequilibrium Hypersonic Aerothermodynamics Using the Direct Simulation Monte Carlo And Navier-Stokes Models
Lofthouse, Andrew J; Jan 17, 2008; 262 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476312; CIO8-0001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hypersonic flight vehicles are a current topic of interest in both civilian and military research. NASA is currently designing a Crew Transport Vehicle (CTV) [44, 69] and Crew Exploration Vehicle (CEV) [32] to replace the space shuttle; reentry vehicles are, by definition, hypersonic vehicles. Military requirements for reconnaissance and surveillance, as well as the mission of the USA Air Force to rapidly project power globally makes the design of a hypersonic plane that can quickly traverse the globe very attractive [102]. The design of hypersonic vehicles requires accurate prediction of the surface properties while in flight. These quantities are typically the heat flux, pressure and shear stress, from which the aerodynamic forces and moments can be calculated. These variables govern not only the aerodynamic performance of the vehicle, but also determine the selection and sizing of the thermal protection system (TPS), which protects the vehicle from the extreme temperatures encountered at hypersonic velocities. The geometry of a vehicle, and in particular, the nose and the leading edges of wings and other aerodynamic surfaces, is a critical consideration in a vehicle's design. Aerodynamic heating is inversely proportional to the square root of the 1 radius at the stagnation point; hence, historically most vehicles have had blunted noses and leading edges to reduce the thermal loads to acceptable levels. Recently, however, a class of materials, designated Ultra-High Temperature Ceramic (UHTC) composites, has been developed that can withstand temperatures as high as 3500 K [57, 78]. Materials such as these allow the use of much sharper leading edges.
DTIC
Aerothermodynamics; Hypersonics; Monte Carlo Method; Navier-Stokes Equation; Nonequilibrium Flow; Reentry Vehicles; Simulation

20080014847 NASA Marshall Space Flight Center, Huntsville, AL, USA

Discrete Gust Model for Launch Vehicle Assessments

Leehy, Frank B.; January 20, 2008; 6 pp.; In English; 13th Conference on Aviation, Range and Aerospace Meteorology/ American Meteorology Society, 20-24 Jan. 2008, New Orleans, LA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014847

Analysis of spacecraft vehicle responses to atmospheric wind gusts during flight is important in the establishment of vehicle design structural requirements and operational capability. Typically, wind gust models can be either a spectral type determined by a random process having a wide range of wavelengths, or a discrete type having a single gust of predetermined magnitude and shape. Classical discrete models used by NASA during the Apollo and Space Shuttle Programs included a 9 m/sec quasi-square-wave gust with variable wavelength from 60 to 300 m. A later study derived discrete gust from a military specification (MIL-SPEC) document that used a '1-cosine' shape. The MIL-SPEC document contains a curve of non-dimensional gust magnitude as a function of non-dimensional gust half-wavelength based on the Dryden spectral model, but fails to list the equation necessary to reproduce the curve. Therefore, previous studies could only estimate a value of gust magnitude from the curve, or attempt to fit a function to it. This paper presents the development of the MIL-SPEC curve, and provides the necessary information to calculate discrete gust magnitudes as a function of both gust half-wavelength and the desired probability level of exceeding a specified gust magnitude.

Author

Gusts; Gust Loads; Launch Vehicles; Discrete Functions; Dynamic Models; Wind (Meteorology); Space Shuttles; Curve Fitting

20080015375 Air Force Research Lab., Edwards AFB, CA USA

The Lightcraft Technology Demonstration Program. Part 1

Mead, Jr, Franklin B; Nov 2007; 304 pp.; In English

Contract(s)/Grant(s): Proj-4847

Report No.(s): AD-A475937; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475937

Part I - The Lightcraft Technology Demonstration Program (LTD) is a report on the development of laser propulsion at the Air Force Research Laboratory (AFRL) between 1996 and 1999. The LTD Program was originally planned in five phases. Phase I, Lightcraft Concept Demonstration, was to demonstrate the feasibility of the basic concept. This phase ended in December 1998. Phase II, Lightcraft Vertical Launches to Extreme Altitudes, was a five-year effort designed to extend Lightcraft flights in sounding rocket trajectories to 30 km with a 100 kW pulsed CO2 laser. Phase III, Lightcraft Dual Mode Vehicle, was planned as a two-year effort designed to launch the first laser-propelled vehicle, a functional Lightcraft, into space. Phase IV was to be a far-term effort, to be conducted over the next 10 to 15 years, to develop a launch capability for Lightcraft weighing 100 kg and costing less than $1.5M to build and launch. The LTD concept was a nanosatellite in which the laser propulsion engine and satellite hardware were intimately shared. The forebody aeroshell acted as an external compression surface (i.e., the airbreathing engine inlet). The afterbody had a dual function as a primary receptive optic (parabolic mirror) for the laser beam and as an external expansion surface (plug nozzle) during the laser rocket mode which is used only in space. The primary thrust structure was the annular shroud. The shroud served as both air inlet and impulsive thrust surface during the airbreathing mode. In the rocket mode, the inlets are closed, and the afterbody and shroud combine to form the rocket thrust chamber and plug ('aerospike type') nozzle.

DTIC

Artificial Satellites; High Power Lasers; Laser Propulsion; Nanosatellites; Propulsion System Configurations; Propulsion System Performance

20080015418 Air Command and Staff Coll., Maxwell AFB, AL USA

Spacepower Theory: Lessons from the Masters

Wagner, John W; Apr 2005; 58 pp.; In English

Report No.(s): AD-A476204; AU/ACSC/3546/2004-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Spacepower, analogous to airpower and sea power, is the ability to use the space medium to project military power. Since the end of the Cold War, the contributions of spacepower to national security and military operations have become increasingly visible in the open press, leading to an increased stated need for a comprehensive spacepower theory. This research is focused toward that need. It explores the central themes and specific points of the 'theoretical masters' of land, sea and air, in order

to draw analogies to the emerging presence of military spacepower. Space will continue to aid combat in other mediums as it offers persistence, range, and near instantaneous speed-enabling a global presence that is unmatched by capabilities in any other medium. However, for spacepower to emerge as a fully competent component of the future joint force, or simply to mature as a combat arm within the US Air Force, a body of serious thought must be given to why we need spacepower and what we intend it to do. Through this analysis, five lessons emerge for spacepower theory: (1) Spacepower must control space lines of communication; (2) Decisive points are key to space control; (3) Spacepower requires superior observation capabilities and the ability to take offensive action; (4) Robust spacepower could lead to enemy paralysis; and (5) Spacepower requires masters of the space medium.
DTIC
Warfare; Space Communication; Aerospace Environments

16
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*.

20080014279 NASA Johnson Space Center, Houston, TX, USA
Optical Studies of Orbital Debris at GEO Using Two Telescopes
Seitzer, P.; Abercromby, K. J.; Rodriquez,H. M.; Barker, E.; [2008]; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

Beginning in March, 2007, optical observations of debris at geosynchronous orbit (GEO) were commenced using two telescopes simultaneously at the Cerro Tololo Inter-American Observatory (CTIO) in Chile. The University of Michigan's 0.6/0.9-m Schmidt telescope MODEST (for Michigan Orbital DEbris Survey Telescope) was used in survey mode to find objects that potentially could be at GEO. Because GEO objects only appear in this telescope's field of view for an average of 5 minutes, a full six-parameter orbit can not be determined. Interrupting the survey for follow-up observations leads to incompleteness in the survey results. Instead, as objects are detected on MODEST, initial predictions assuming a circular orbit are done for where the object will be for the next hour, and the objects are reacquired as quickly as possible on the CTIO 0.9-m telescope. This second telescope then follows-up during the first night and, if possible, over several more nights to obtain the maximum time arc possible, and the best six parameter orbit. Our goal is to obtain an initial orbit for all detected objects fainter than R = 15th in order to estimate the orbital distribution of objects selected on the basis of two observational criteria: magnitude and angular rate. Objects fainter than 15th are largely uncataloged and have a completely different angular rate distribution than brighter objects. Combining the information obtained for both faint and bright objects yields a more complete picture of the debris environment rather than just concentrating on the faint debris. One objective is to estimate what fraction of objects selected on the basis of angular rate are not at GEO. A second objective is to obtain magnitudes and colors in standard astronomical filters (BVRI) for comparison with reflectance spectra of likely spacecraft materials. This paper reports on results from two 14 night runs with both telescopes: in March and November 2007: (1) A significant fraction of objects fainter than R = 15th have eccentric orbits (e > 0.1) (2) Virtually all objects selected on the basis of angular rate are in the GEO and GTO regimes. (3) Calibrated magnitudes and colors in BVRI were obtained for many objects fainter than R = 15th magnitude. This work is supported by NASA's Orbital Debris Program Office, Johnson Space Center, Houston, Texas, USA. Author
Space Debris; Visual Observation; Near Earth Objects; Geosynchronous Orbits

17
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*.

20080015415 Air Command and Staff Coll., Maxwell AFB, AL USA
A New Flexible Global Positioning System (GPS) Constellation Sustainment Strategy
Goldstein, David B; Apr 2003; 39 pp.; In English
Report No.(s): AD-A476362; AU/ACSC/21-1607; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Global Positioning System 'GPS' is now a global utility. The USA Air Force is the steward responsible for sustaining

and modernizing the constellation. The current launch-to-sustain strategy implemented by the Air Force is not flexible, does not effectively support GPS modernization, and it does not lend itself to a future responsive launch paradigm. A more flexible sustainment strategy is required where the constellation is minimally sustained in preparation for a transformational modernization. A minimalist sustainment or launch-on-failure strategy has the advantage of requiring fewer total spacecraft and providing more concrete and intentional launch decisions. Once a new spacecraft block has been developed and delivered, a launch-to-transform strategy could be invoked where satellites would be launched at the maximum rate possible. This flexible launch strategy would both sustain the constellation and provide an opportunity to transform the constellation relatively quickly. It is therefore the suggestion of this paper that the current launch-on-predicted-failure strategy be replaced by the more flexible launch-on-failure strategy with the option to pursue a launch-to-transform strategy when GPS III satellites become available.
DTIC
Constellations; Global Positioning System; Navigation Satellites

20080015656 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Advanced Video Guidance Sensor: Orbital Express and the Next Generation
Howard, Richard T.; Heaton, Andrew F.; Pinson, Robin M.; Carrington, Connie L.; Lee, James E.; Bryan, Thomas C.; Robertson, Bryan A.; Spencer, Susan H.; Johnson, Jimmie E.; February 10, 2008; 8 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015656

The Orbital Express (OE) mission performed the first autonomous rendezvous and docking in the history of the USA on May 5-6, 2007 with the Advanced Video Guidance Sensor (AVGS) acting as one of the primary docking sensors. Since that event, the OE spacecraft performed four more rendezvous and docking maneuvers, each time using the AVGS as one of the docking sensors. The Marshall Space Flight Center's (MSFC's) AVGS is a nearfield proximity operations sensor that was integrated into the Autonomous Rendezvous and Capture Sensor System (ARCSS) on OE. The ARCSS provided the relative state knowledge to allow the OE spacecraft to rendezvous and dock. The AVGS is a mature sensor technology designed to support Automated Rendezvous and Docking (AR&D) operations. It is a video-based laser-illuminated sensor that can determine the relative position and attitude between itself and its target. Due to parts obsolescence, the AVGS that was flown on OE can no longer be manufactured. MSFC has been working on the next generation of AVGS for application to future Constellation missions. This paper provides an overview of the performance of the AVGS on Orbital Express and discusses the work on the Next Generation AVGS (NGAVGS).
Author
Spacecraft Docking; Space Rendezvous; Autonomous Docking; Guidance Sensors; Orbital Rendezvous; Attitude (Inclination)

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*.

20080014278 NASA Langley Research Center, Hampton, VA, USA
European Directions for Hypersonic Thermal Protection Systems and Hot Structures
Glass, David E.; January 22, 2007; 44 pp.; In English; 31st Annual Conference on Composites Materials and Structures, 22-25 Jan. 2007, Daytona Beach, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 167530.01.049SY0.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014278

This presentation will overview European Thermal Protection Systems (TPS) and Hot Structures activities in Europe. The Europeans have a lot of very good work going on in the area. The presentation will discuss their emphasis on focused technology development for their flight vehicles.
Author
Thermal Protection; Hypersonic Aircraft; Hypersonic Heat Transfer; Hypersonic Test Apparatus; Heat Shielding

20080014306 NASA Langley Research Center, Hampton, VA, USA
External Tank (ET) Foam Thermal/Structural Analysis Project
Moore, David F.; Ungar, Eugene K.; Chang, Li C.; Malroy, Eric T.; Stephan, Ryan A.; January 2008; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 510505.01.07.01.06
Report No.(s): NASA/TM-2008- 215102; NESC-RP-06-55/06-012-I; L-19443; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014306

An independent study was performed to assess the pre-launch thermally induced stresses in the Space Shuttle External Tank Bipod closeout and Ice/Frost ramps (IFRs). Finite element models with various levels of detail were built that included the three types of foam (BX-265, NCFI 24-124, and PDL 1034) and the underlying structure and bracketry. Temperature profiles generated by the thermal analyses were input to the structural models to calculate the stress levels. An area of high stress in the Bipod closeout was found along the aluminum tank wall near the phenolic insulator and along the phenolic insulator itself. This area of high stress might be prone to cracking and possible delamination. There is a small region of slightly increased stress in the NCFI 24-124 foam near its joint with the Bipod closeout BX-265 foam. The calculated stresses in the NCFI 24-124 acreage foam are highest at the NCFI 24-124/PDL 1034/tank wall interface under the LO2 and LH2 IFRs. The highest calculated stresses in the LH2 NCFI 24-124 foam are higher than in similar locations in the LO2 IFR. This finding is consistent with the dissection results of IFRs on ET-120.
Author
External Tanks; Foams; Structural Analysis; Thermal Analysis; Space Shuttles; Ice; Frost; Temperature Effects; Delaminating

20080014316 NASA Johnson Space Center, Houston, TX, USA
Constellation Program Flight Test Methodology and Strategy
Vigil, Art; Rivas, Mauricio; Moses, Robert; [2008]; 8 pp.; In English; 24th Aerospace Testing Seminar, 7-10 Apr. 2008, Manhattan Beach, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014316

Main projects elements: a) Orion & Ares b) New & Modified heritage hardware. c) Shuttle retirement in 2010. Methodology: a) Flight test objectives. b) Risk reduction. Strategy a) Mapping Flight Test Objectives. b) Build incremental capability.
Author
Constellation Program; Flight Tests; NASA Programs; Space Shuttles; Launch Vehicles

20080014345 NASA Kennedy Space Center, Cocoa Beach, FL, USA
The Summer of Hydrogen
Weber, Philip; Ask Magazine; Winter 2008, pp. 5-7; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014345

Ground crew veterans at Kennedy Space Center still talk about what they call ‘the summer of hydrogen’-the long, frustrating months in 1990 when the shuttle fleet was grounded by an elusive hydrogen leak that foiled our efforts to fill the orbiter’s external fuel tank. Columbia (STS-35) was on Launch Pad A for a scheduled May 30 launch when we discovered the hydrogen leak during - tanking. The external fuel tank is loaded through the orbiter. Liquid hydrogen flows through a 17-inch umbilical between the orbiter and the tank. During fueling, we purge the aft fuselage with gaseous nitrogen to reduce the risk of fire, and we have a leak-detection system in the mobile launch platform, which samples (via tygon tubing) the atmosphere in and around the vehicle, drawing it down to a mass spectrometer that analyzes its composition. When we progressed to the stage of tanking where liquid hydrogen flows through the vehicle, the concentration of hydrogen approached four percent-the limit above which it would be dangerously flammable. We had a leak. We did everything we could think of to find it, and the contractor who supplied the flight hardware was there every day, working alongside us. We did tanking tests, which involved instrumenting the suspected leak sources, and cryo-loaded the external tank to try to isolate precisely where the leak originated. We switched out umbilicals; we replaced the seals between the umbilical and the orbiter. We inspected the seals microscopically and found no flaws. We replaced the recirculation pumps, and we found and replaced a damaged teflon seal in a main propulsion system detent cover, which holds the prevalve-the main valve supplying hydrogen to Space Shuttle Main Engine 3 -in the open position. The seal passed leak tests at ambient temperature but leaked when cryogenic temperatures were applied. We added new leak sensors-up to twenty at a time and tried to be methodical in our placements to narrow down the possible sources of the problem. We even switched orbiters, sending Columbia back to the Vehicle

Assembly Building and bringing out Atlantis, scheduled to fly as STS-38. Two shuttles on their mobile launchers passing in the night was a majestic sight, but not one you want to see if you're trying to get an orbiter launched. None of this told us where the leak was, or if we were dealing with more than one leak source.
Derived from text
External Tanks; Liquid Hydrogen; Leakage; Cryogenic Temperature; Fuel Tanks; Space Transportation System

20080014348 NASA, Washington, DC, USA
Dawn: Cooperation, not Control
May, Todd; Ask Magazine; Winter 2008, pp. 12-15; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014348

On September 27, 2007, a Delta II rocket carrying the Dawn spacecraft lifted off from Kennedy Space Center. Part of NASAs Discovery program, the $370 million Dawn mission began its three-billion-mile voyage to the asteroid belt to study the asteroid Vesta and Ceres, a dwarf planet. The spacecraft is scheduled to reach Vesta in 2011. After spending nine months measuring the composition, shape, and topography of that body, it will travel a billion miles to carry out a similar analysis of Ceres in 2015. The Important Lessons: The demands of Dawn and other challenging missions have taught some important lessons for successful program and project management. These are the main ones: a) Program management, particularly of uncoupled and loosely coupled projects, should be more about enabling than controlling. You're working with motivated, high-performing teams and institutions with a track record of quality and success. Emphasize commander's intent over rudder control; let them know where you want to go and when you want to be there, then let them figure out how to get there. b) Open and honest discussion of issues is essential. People fill the void of the unknown with their worst fears. Get folks around the table and have open, honest, and frank dialogue. I've seldom seen this fail to get to the root of issues. c) You have to earn your seat at the table, proving that you are competent, trustworthy, and dedicated to the success of the mission. d) Know when to fold 'em. Your pride can get rolled up in making a milestone or launch date, but you have to make a judgment based on the realities of the situation and not wear down the team trying to meet an increasingly impossible deadline. e) The NASA governance model that gives a voice to the concerns of engineers and safety experts works-trust it and use it.
Derived from text
Project Management; Discovery (Orbiter); Vesta Asteroid; Ceres Asteroid; Asteroid Belts; Dwarf Planets; Space Missions

20080014810 NASA Johnson Space Center, Houston, TX, USA
Outcome of Recent Satellite Impact Experiments
Hanada, Toshiya; Liou, J.-C.; Nakajima, Takashi; Stansbery, Eugene; [2008]; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

This paper summarizes three satellite impact tests completed in early 2007 through collaboration between Kyushu University and the NASA Orbital Debris Program Office. The previous experiments completed in late 2005 aimed to compare low- and hyper-velocity impacts on identical target satellites, whereas the new tests used larger satellites as targets and aimed to investigate the effects of impact directions. Three identical micro satellites equipped with fully-functional electronic devices were prepared as targets. Their dimensions were 20 cm by 20 cm by 20 cm, and the mass of each was approximately 1.3 kilograms. Aluminum alloy solid spheres, with diameters of 3 cm and masses of 39 grams were prepared as projectiles. The impact velocity was approximately 1.7 km/s. The impact tests were carried out at the two-stage light gas gun facility at the Kyushu Institute of Technology. All three target satellites were completely fragmented, but there were noticeable differences among the three sets of fragments due to the different impact directions. More than 1000 fragments from each test were collected, measured, photographed, and documented with material descriptions. The analysis of the fragments is currently in progress. Preliminary results of the new data and comparisons with previous data will be included in the paper.
Author
Impact Tests; Impact Velocity; Low Speed; Space Debris; Fragments; Light Gas Guns; Projectiles

20080014835 NASA Dryden Flight Research Facility, Edwards, CA, USA
A Covert Disruptive Technology: Test and Development of the Corona Satellite
Peebles, Curtis; ITEA Journal; January 2008; Volume 28, No. 4, pp. 135-137; In English; Copyright; Avail.: Other Sources

The launching by the Soviet Union of the Sputnik satellite in 19457 was an impetuous to the USA. The Intercontinental ballistic Missile (ICBM) that launched the Earth's first satellite, could have been armed with a nuclear warhead, that could destroy an American city. The primary intelligence requirement that the US had was to determine the actual size of the Soviet

missile program. To this end, a covert, high-risk photoreconnaissance satellite was developed. The code name of this program was ‘Corona.’ This article describes the trials and eventual successes of the Corona program.
CASI
Photoreconnaissance; Spacecraft Launching; Histories; Satellite-Borne Photography; Space Surveillance (Spaceborne); Discoverer Satellites

20080014848 NASA Langley Research Center, Hampton, VA, USA
Integrated Thermal Protection Systems and Heat Resistant Structures
Pichon, Thierry; Lacoste, Marc; Glass, David E.; January 23, 2006; 45 pp.; In English; 30th Annual Conference on Composites, Materials, and Structures, 23-26 Jan. 2006, Cocoa Beach, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NND04AA85C; Copyright; Avail.: CASI: A03, Hardcopy

In the early stages of NASA’s Exploration Initiative, Snecma Propulsion Solide was funded under the Exploration Systems Research & Technology program to develop integrated thermal protection systems and heat resistant structures for reentry vehicles. Due to changes within NASA’s Exploration Initiative, this task was cancelled early. This presentation provides an overview of the work that was accomplished prior to cancellation. The Snecma team chose an Apollo-type capsule as the reference vehicle for the work. They began with the design of a ceramic aft heatshield (CAS) utilizing C/SiC panels as the capsule heatshield, a C/SiC deployable decelerator and several ablators. They additionally developed a health monitoring system, high temperature structures testing, and the insulation characterization. Though the task was pre-maturely cancelled, a significant quantity of work was accomplished.
Derived from text
Heat Shielding; Systems Integration; Thermal Protection; Thermal Resistance; Reentry Vehicles

20080015394 Government Accountability Office, Washington, DC, USA
NASA: Ares I and Orion Project Risks and Key Indicators to Measure Progress
April 03, 2008; 23 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-08-186T; No Copyright; Avail.: CASI: A03, Hardcopy

NASA is currently working toward preliminary design reviews for the Ares I and Orion vehicles. While this is a phase for discovery and risk reduction, there are considerable unknowns as to whether NASA’s plans for these vehicles can be executed within schedule goals and what these efforts will ultimately cost. This is primarily because NASA is still in the process of defining performance requirements and some of these uncertainties could affect the vehicles’ mass, loads, and weight requirements. NASA is also working through significant technical risks, such as oscillation within the first stage of the Ares I vehicle, which computer modeling indicates could cause unacceptable structural vibrations. Oversight based on best practices and key indicators will be vital to assessing program success throughout development. Key indicators include areas commonly underestimated in space programs such as weight growth and software complexity, as well as indicators used by best practice organizations to assess readiness to move forward in the development cycle. Three critical junctures at which developers must have knowledge to make large investment decisions--preliminary design review, critical design review and production review--are reviewed. In looking at the first major investments, it is important to recognize that the Ares I and Orion projects are risky endeavors, largely due to their complexity, scope, and interdependencies. It is also important to recognize that the desire to minimize the gap in human space flight adds considerable risk, since it could limit NASA’s ability to study emerging problems and pursue alternative ways of addressing them. For these reasons, as well as the magnitude of investment at stake, it is imperative that NASA be realistic and open about the progress it is making and to be willing to make changes to the architecture and design if technical problems can not be solved without overly compromising performance. Additionally, Congress needs to be well-informed about remaining knowledge gaps and what tradeoffs or additional resources are needed to close them.
Derived from text
Ares 1 Launch Vehicle; Crew Exploration Vehicle; Spacecraft Design; Aerospace Engineering; Project Planning

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*.

20080014331 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Operation and Performance of the Mars Exploration Rover Imaging System on the Martian Surface

Maki, Justin N.; Litwin, Todd; Herkenhoff, Ken; October 10, 2005; 14 pp.; In English; IEEE International Conference on Systems, Man, and Cybermetrics, 10 Oct. 2005, Waikoloa, HI, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40694

This slide presentation details the Mars Exploration Rover (MER) imaging system. Over 144,000 images have been gathered from all Mars Missions, with 83.5% of them being gathered by MER. Each Rover has 9 cameras (Navcam, front and rear Hazcam, Pancam, Microscopic Image, Descent Camera, Engineering Camera, Science Camera) and produces 1024 x 1024 (1 Megapixel) images in the same format. All onboard image processing code is implemented in flight software and includes extensive processing capabilities such as autoexposure, flat field correction, image orientation, thumbnail generation, subframing, and image compression. Ground image processing is done at the Jet Propulsion Laboratory's Multimission Image Processing Laboratory using Video Image Communication and Retrieval (VICAR) while stereo processing (left/right pairs) is provided for raw image, radiometric correction; solar energy maps,triangulation (Cartesian 3-spaces) and slope maps.

Derived from text

Mars Roving Vehicles; Mars Missions; Cameras; Data Acquisition; Mars Exploration; Onboard Equipment; Image Processing

20080015657 NASA Marshall Space Flight Center, Huntsville, AL, USA

Multi-sensor Testing for Automated Rendezvous and Docking

Howard, Richard T.; Carrington, Connie K.; February 10, 2008; 8 pp.; In English; Space Technology and Applications International Forum, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains color illustrations; No Copyright; Avail.:

CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015657

During the past two years, many sensors have been tested in an open-loop fashion in the Marshall Space Flight Center (MSFC) Flight Robotics Laboratory (FRL) to both determine their suitability for use in Automated Rendezvous and Docking (AR&D) systems and to ensure the test facility is prepared for future multi-sensor testing. The primary focus of this work was in support of the CEV AR&D system, because the AR&D sensor technology area was identified as one of the top risks in the program. In 2006, four different sensors were tested individually or in a pair in the MSFC FRL. In 2007, four sensors, two each of two different types, were tested simultaneously. In each set of tests, the target was moved through a series of pre-planned trajectories while the sensor tracked it. In addition, a laser tracker 'truth' sensor also measured the target motion. The tests demonstrated the functionality of testing four sensors simultaneously as well as the capabilities (both good and bad) of all of the different sensors tested. This paper outlines the test setup and conditions, briefly describes the facility, summarizes the earlier results of the individual sensor tests, and describes in some detail the results of the four-sensor testing. Post-test analysis includes data fusion by minimum variance estimation and sequential Kalman filtering. This Sensor Technology Project work was funded by NASA's Exploration Technology Development Program.

Author

Multisensor Fusion; Guidance Sensors; Spacecraft Docking; Orbital Rendezvous; Multisensor Applications; Robotics

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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*.

20080014861 NASA Langley Research Center, Hampton, VA, USA
Aerocapture Technology Development Overview
Munk, Michelle M.; Moon, Steven A.; March 2008; 7 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 346620.04.04.01.07.17; Copyright; Avail.: CASI: A02, Hardcopy

This paper will explain the investment strategy, the role of detailed systems analysis, and the hardware and modeling developments that have resulted from the past 5 years of work under NASA's In-Space Propulsion Program (ISPT) Aerocapture investment area. The organizations that have been funded by ISPT over that time period received awards from a 2002 NASA Research Announcement. They are: Lockheed Martin Space Systems, Applied Research Associates, Inc., Ball Aerospace, NASA s Ames Research Center, and NASA s Langley Research Center. Their accomplishments include improved understanding of entry aerothermal environments, particularly at Titan, demonstration of aerocapture guidance algorithm robustness at multiple bodies, manufacture and test of a 2-meter Carbon-Carbon 'hot structure,' development and test of evolutionary, high-temperature structural systems with efficient ablative materials, and development of aerothermal sensors that will fly on the Mars Science Laboratory in 2009. Due in large part to this sustained ISPT support for Aerocapture, the technology is ready to be validated in flight.
Author
Aerocapture; Aerothermodynamics; Support Systems; Systems Analysis; High Temperature; Propulsion; Aerospace Systems

20080015504 New South Wales Univ., Canberra, Australia; NASA Langley Research Center, Hampton, VA, USA
Investigation of Hypersonic Nozzle Flow Uniformity Using NO Fluorescence
O'Byrne, S.; Danehy, P. J.; Houwing, A. F. P.; [2005]; 7 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Planar laser-induced fluorescence visualisation is used to investigate nonuniformities in the flow of a hypersonic conical nozzle. Possible causes for the nonuniformity are outlined and investigated, and the problem is shown to be due to a small step at the nozzle throat. Entrainment of cold boundary layer gas is postulated as the cause of the signal nonuniformity.
Author
Hypersonic Nozzles; Conical Nozzles; Nozzle Flow; Nonuniformity; Nitric Oxide; Laser Induced Fluorescence; Hypersonic Flow

20080015524 NASA Marshall Space Flight Center, Huntsville, AL, USA
Future NTP Development Synergy Leveraged from Current J-2X Engine Development
Ballard, Richard O.; February 10, 2008; 7 pp.; In English; Institute for Space and Nuclear Power Studies (ISNPS), 10-14 Feb. 2008, Albuquerque, Mexico; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015524

This paper is a discussion of how the many long-lead development elements required for the realization of a future nuclear thermal propulsion (NTP) system can be effectively leveraged from the ongoing work being conducted on the J-2X engine program for the Constellation Program. Development studies conducted to date for NTP forward planning have identified a number of technical areas that will require advancement to acceptable technology readiness levels (TRLs) before they can be utilized in NTP system development. These include high-temperature, high-area ratio nozzle extension; long-life, low-NPSP. turbomachinery; and low-boiloff propellant management; and a qualified nuclear fuel element. The current J-2X program is working many of these areas that can be leveraged to support NTP development in a highly compatible and synergistic fashion. In addition to supporting technical development, there are other programmatic issues being worked in the J-2X program that can be leveraged by a future NTP development program. These include compliance with recently-evolved space system requirements such as human-rating, fault tolerance and fracture control. These and other similar mandatory system requirements have been adopted by NASA and can result in a significant technical impact beyond elevation of the root technologies required by NTP. Finally, the exploitation of experience, methodologies, and procedures developed by the J-2X program in the areas of verification, qualification, certification, altitude simulation testing, and facility definition will be especially applicable to a future NTP system. The similarities in system mission (in-space propulsion) and operational

environment (vacuum, zero-gee) between J-2X and NTP make this highly synergistic. Thus, it can be $hown that the collective benefit of leveraging experience and technologies developed during the J-2X program can result in significant savings in development cost and schedule for NTP.
Author
Nuclear Propulsion; Engine Design; Performance Tests; Fault Tolerance; High Temperature; Nuclear Fuel Elements

20080015542 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Solar-Powered Europa Orbiter Design Study (2007)
Elliott, John; Langmaier, Jerry; Pappalardo, Robert; Strange, Nathan; Spilker, Tom; Lock, Rob; Reh, Kim; January 2008; 12 pp.; In English; Original contains color illustrations
Report No.(s): JPL 08-02; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40726

The feasibility of implementing a solar-powered mission around Europa has been evaluated periodically over the last decade. Most recently, an assessment was performed as part of the 2006 Europa Explorer (EE) Study, which evaluated the practicality of implementing that mission design with large solar arrays instead of radioisotope power systems (RPS). This previous study went into some depth in considering the issues related to the use of solar arrays in the Europa orbit illumination and radiation environment. The study concluded that an all-solar option was impractical to meet the science objectives as defined in that study by the science team. This conclusion resulted from the prohibitive mass, packaging and articulation issues associated with the very large (approx.300 sq m) solar arrays required to accommodate frequent eclipse periods associated with the particular Europa orbit used.
Author
Solar Powered Aircraft; Solar Electric Propulsion; Solar Arrays; Mission Planning; Europa

20080015547 Lockheed Martin Corp., Denver, CO, USA; NASA Glenn Research Center, Cleveland, OH, USA
Development of a Power Electronics Controller for the Advanced Stirling Radioisotope Generator
Leland, Douglas K.; Priest, Joel F.; Keiter, Douglas E.; Schreiber, Jeffrey G.; February 2008; 19 pp.; In English; Fifth International Energy Conversion Engineering Conference and Exhibit, 25-27 June 2007, St. Louis, MO, USA; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-215031; AIAA Paper 2007-4737; E-16074; Copyright; Avail.: CASI: A03, Hardcopy

Under a U.S. Department of Energy program for radioisotope power systems, Lockheed Martin is developing an Engineering Unit of the Advanced Stirling Radioisotope Generator (ASRG). This is an advanced version of the previously reported SRG110 generator. The ASRG uses Advanced Stirling Convertors (ASCs) developed by Sunpower Incorporated under a NASA Research Announcement contract. The ASRG makes use of a Stirling controller based on power electronics that eliminates the tuning capacitors. The power electronics controller synchronizes dual-opposed convertors and maintains a fixed frequency operating point. The controller is single-fault tolerant and uses high-frequency pulse width modulation to create the sinusoidal currents that are nearly in phase with the piston velocity, eliminating the need for large series tuning capacitors. Sunpower supports this effort through an extension of their controller development intended for other applications. Glenn Research Center (GRC) supports this effort through system dynamic modeling, analysis and test support. The ASRG design arrived at a new baseline based on a system-level trade study and extensive feedback from mission planners on the necessity of single-fault tolerance. This paper presents the baseline design with an emphasis on the power electronics controller detailed design concept that will meet space mission requirements including single fault tolerance.
Author
Stirling Cycle; Isotopes; Controllers; Pulse Duration Modulation; Capacitors; Frequencies; Fault Tolerance; Sine Waves

20080015567 NASA Marshall Space Flight Center, Huntsville, AL, USA
Materials Needs for Future In-space Propulsion Systems
Johnson, Charles Les; February 21, 2008; 1 pp.; In English; Tec de Monterrey/Student's Association of Industrial Physicist Engineers, 21-23 Feb. 2008, Monterrey, Mexico; No Copyright; Avail.: Other Sources; Abstract Only

NASA is developing the next generation of in-space propulsion systems in support of robotic exploration missions throughout the solar system. The propulsion technologies being developed are non-traditional and have stressing materials performance requirements. (Chemical Propulsion) Earth-storable chemical bipropellant performance is constrained by temperature limitations of the columbium used in the chamber. Iridium/rhenium (Ir/Re) is now available and has been implemented in initial versions of Earth-Storable rockets with specific impulses (Isp) about 10 seconds higher than columbium

rocket chambers. New chamber fabrication methods that improve process and performance of Ir/Re and other promising material systems are needed. (Solar Sail Propulsion) The solar sail is a propellantless propulsion system that gains momentum by reflecting sunlight. The sails need to be very large in area (from 10000 m2 up to 62500 m2) yet be very lightweight in order to achieve adequate accelerations for realistic mission times. Lightweight materials that can be manufactured in thicknesses of less than 1 micron and that are not harmed by the space environment are desired. (Aerocapture) Blunt Body Aerocapture uses aerodynamic drag to slow an approaching spacecraft and insert it into a science orbit around any planet or moon with an atmosphere. The spacecraft is enclosed by a rigid aeroshell that protects it from the entry heating and aerodynamic environment. Lightweight, high-temperature structural systems, adhesives, insulators, and ablatives are key components for improving aeroshell efficiencies at heating rates of 1000-2000 W/cu cm and beyond. Inflatable decelerators in the forms of ballutes and inflatable aeroshells will use flexible polymeric thin film materials, high temperature fabrics, and structural adhesives. The inflatable systems will be tightly packaged during cruise and will be inflated prior to entry interface at the destination. Materials must maintain strength and flexibility while packaged at cold temperatures (_100oC) for up to 10 years and then withstand the high temperatures (500oC) encountered during aerocapture. The presentation will describe the status of each propulsion technology and summarize the materials needed for their implementation.
Author
Propulsion System Performance; Chemical Propulsion; Liquid Rocket Propellants; Robotics; Iridium; High Temperature; Specific Impulse; Rhenium

20080015668 NASA Marshall Space Flight Center, Huntsville, AL, USA
Nuclear Thermal Rocket Element Environmental Simulator (NTREES)
Emrich, William J., Jr.; February 10, 2008; 8 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015668

To support the eventual development of a nuclear thermal rocket engine, a state-of-the-art experimental test setup has been constructed to evaluate the performance characteristics of candidate fuel element materials and geometries in representative environments. The test device simulates the environmental conditions (minus the radiation) to which nuclear rocket fuel components will be subjected during reactor operation. Test articles mounted in the simulator are inductively heated in such a manner as to accurately reproduce the temperatures and heat fluxes normally expected to occur as a result of nuclear fission while at the same time being exposed to flowing hydrogen. This project is referred to as the Nuclear Thermal Rocket Element Environment Simulator or NTREES. The NTREES device is located at the Marshall Space flight Center in a laboratory which has been modified to accommodate the high powers required to heat the test articles to the required temperatures and to handle the gaseous hydrogen flow required for the tests. Other modifications to the laboratory include the installation of a nitrogen gas supply system and a cooling water supply system. During the design and construction of the facility, every effort was made to comply with all pertinent regulations to provide assurance that the facility could be operated in a safe and efficient manner. The NTREES system can currently supply up to 50 kW of inductive heating to the fuel test articles, although the facility has been sized to eventually allow test article heating levels of up to several megawatts.
Author
Nuclear Rocket Engines; High Temperature Tests; Environment Simulators; Engine Tests; Cooling Systems; Nuclear Fission; Gas Cooling

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*.

20080014308 NASA Glenn Research Center, Cleveland, OH, USA
Effects of C/O Ratio and Temperature on Sooting Limits of Spherical Diffusion Flames
Lecoustre, V. R.; Sunderland, P. B.; Chao, B. H.; Urban, D. L.; Stocker, D. P.; Axelbaum, R. L.; [2008]; 9 pp.; In English; 46th AIAA Aerospace Sciences Meeting, 7-10 Jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC3-696; NAG3-1912; NNC05-AA46A; NCC3-697; NAG3-1910; WBS 526282.01.03.02.02.21
Report No.(s): AIAA Paper-2008-827; Copyright; Avail.: CASI: A02, Hardcopy

Limiting conditions for soot particle inception in spherical diffusion flames were investigated numerically. The flames

were modeled using a one-dimensional, time accurate diffusion flame code with detailed chemistry and transport and an optically thick radiation model. Seventeen normal and inverse flames were considered, covering a wide range of stoichiometric mixture fraction, adiabatic flame temperature, residence time and scalar dissipation rate. These flames were previously observed to reach their sooting limits after 2 s of microgravity. Sooting-limit diffusion flames with scalar dissipation rate lower than 2/s were found to have temperatures near 1400 K where C/O = 0.51, whereas flames with greater scalar dissipation rate required increased temperatures. This finding was valid across a broad range of fuel and oxidizer compositions and convection directions.
Author
Flame Temperature; Diffusion Flames; Energy Dissipation; Stoichiometry; Particle Diffusion; Soot

20080014438 Engineering Research and Consulting, Inc., Edwards AFB, CA USA
A Practical Methylation Procedure for (1H)-1,2,4-Triazole (Preprint)
Belletire, John L; Bills, Robert A; Shackelford, Scott A; Jun 2007; 17 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A475815; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475815

Conversion of (1H)-1,2,4-triazole to its sodium salt with methanolic sodium methoxide is followed by reaction with iodomethane. A scalable approach that overcomes problems associated with water-soluble starting material and water-soluble product combined continuous extraction (chloroform/water) with a final short-path distillation under a controlled vacuum to obtain spectroscopically pure 1-methyl-1,2,4-triazole in 63 percent yield. Adaptation to microwave synthesis conditions, while providing a faster reaction time, offers no product yield or purification advantages over the conventional approach described. Conversions of this product to related derivatives such as 1,4-dimethyl-1,2,4-triazolium iodide and 1-methyl-1,2,4-triazolium hydrochloride are readily achieved.
DTIC
Heterocyclic Compounds; Methylation

20080014543 Wyoming Univ., Laramie, WY USA
Imaging Tools and Thin Film Coatings for Corrosion Prevention in Aluminum Alloys
Buttry, Daniel A; Jan 18, 2008; 4 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0438
Report No.(s): AD-A476058; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476058

The fundamental activities involved use of various imaging techniques to study corrosion processes that occur at metal surfaces. We applied these methods to understand both the anodic and cathodic processes involved in corrosion at Al alloy surfaces, and how those processes are influenced by environmental conditions. The applied activities were development and testing of new corrosion inhibition systems based on blends of thermoplastics and conducting polymers. These blends contain smart controlled release polymers capable of releasing inhibitors in response to local pH changes. These unique materials combine the attractive mechanical properties of thermoplastics with the known corrosion inhibition properties of conducting polymers. Finally, we were involved in transfer of a novel chemical etching technology for Al alloy surface pretreatment to Luna Innovations, Inc. to produce new environmentally compliant coating systems for the protection of aging Air Force aircraft. Luna's technology is now being tested at AFRL laboratories.
DTIC
Aluminum Alloys; Corrosion Prevention; Electrochemistry; Fluorescence; Imaging Techniques; Microscopy; Protective Coatings; Thin Films

20080014651 Library of Congress, Washington, DC USA
Engineered Nanoscale Materials and Derivative Products: Regulatory Challenges
Schierow, Linda-Jo; Jan 22, 2008; 27 pp.; In English
Report No.(s): AD-A476114; CRS-RL34332; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Scientists and engineers are rapidly learning how to examine, design, and manipulate materials at the molecular level, termed nanoscale, between 1 and 100 billionths of a meter. The U.S. government has invested billions of dollars to ensure that American industry remains a global leader in the field, because the products of nanotechnology are seen to have great economic potential and offer possible solutions to national problems ranging from energy efficiency to detection of agents of

biological warfare. Optimism about nanotechnology is tempered, however, by concerns about the unknown potential of nanoscale materials to harm the environment and human health. Some have called for federal regulation of potential environmental, human health, and safety (EHS) risks, arguing that the lack of federal EHS regulations increases the risks of unanticipated adverse consequences due to human or environmental exposure to engineered nanomaterials. The cost of such consequences would depend on their actual, as well as publically perceived, severity, frequency, and reversibility. The cost to the nanotechnology industry could be great, if consumers responded to a potential threat of harm by indiscriminately rejecting all products of nanotechnology, rather than the offending nanomaterial or an individual application. Others oppose federal regulatory requirements, arguing that they might unnecessarily delay the environmental, health, and economic rewards expected from nanotechnology. Questions about the need for, and ideal form of, nanotechnology regulations are exceedingly difficult to address, given the current state of scientific understanding of engineered nanoscale materials. The purpose of this report is to consider certain challenges faced by scientists, entrepreneurs, and officials in the 25 agencies involved in the National Nanotechnology Program, as they strive to define the characteristics of nanomaterials, the EHS risks they might pose, and any risks should be addressed.
DTIC
Derivation; Law (Jurisprudence); Nanotechnology; Risk

20080014707 Iowa Univ., Iowa City, IA USA
Sustainability of Long-Term Abiotic Attenuation of Chlorinated Ethenes
Scherer, Michelle M; O'Loughlin, Edward; Parkin, Gene F; Valentine, Richard; Al-Hosney, Hashim; Handler, Robert; Just, Collin; Larese-Casanova, Phil; Pasakarnis, Timothy; Smith, Sharon L; Sep 28, 2007; 49 pp.; In English
Contract(s)/Grant(s): Proj-ER-1369
Report No.(s): AD-A476323; No Copyright; Avail.: Defense Technical Information Center (DTIC)
mechanisms that may contribute to the attenuation of chlorinated ethene plumes. To this end, we measured the reduction of chlorinated ethenes by a series of chemically and microbially generated reductants under a range of natural conditions. During the project, we collected, synthesized, and characterized a variety of reductants and measured the extent and rate of PCE, TCE and cDCE reduction in batch reactors. The reductants included, (i) Fe(II) sorbed on Fe oxides, (ii) minerals containing Fe(II), such as iron sulfides (e.g., mackinawite) and green rusts, (iii) precipitates and supernatant collected from dissimilatory iron reducing (DIR) cultures of Shewanella species and an sulfate reducing bacterial (SRB) culture of Desulfovibrio desulfuricans, and (iii) sorbed and reduced natural organic matter (NOM) and NOM model compounds.
DTIC
Attenuation; Chlorination; Chlorocarbons; Ethane; Hydrocarbons; Oxides

20080015529 Army Chemical Materials Agency, Aberdeen Proving Ground, MA USA
Handling Hazardous Waste Safely at CMA Disposal Facilities and Operations
Jan 2007; 3 pp.; In English
Report No.(s): AD-A476296; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The U S Army Chemical Materials Agency (CMA) works with federal and state environmental regulators to dispose of chemical weapons safely. An important part of CMA's work is managing hazardous wastes that are generated throughout chemical weapons storage and disposal processes in compliance with all applicable laws. At each CMA chemical weapons disposal facility's hazardous waste is identified and tightly regulated through the facility's operating permit issued by the state environmental agency storage and float disposal of all wastes are detailed in that permit. Also, each facility is designed in close consultation with state and federal regulatory agencies to ensure that waste management practices do not pose harm to the public, workers or the environment CMA recognizes, and implements, prevention as a guiding principle of waste management: disposal facilities are designed and operated to minimize the volume and toxicity of hazardous wastes.
DTIC
Chemical Warfare; Hazardous Wastes; Safety; Waste Disposal

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20080014255 NASA Langley Research Center, Hampton, VA, USA
Anisotropic Laminar Piezocomposite Actuator Incorporating Machined PMN-PT Single Crystal Fibers
Wilkie, W. Keats; Inman, Daniel J.; Lloyd, Justin M.; High, James W.; Journal of Intelligent Material Systems and Structures; [2006]; Volume 17, No. 1, pp. 15-28; In English; Original contains color illustrations
Contract(s)/Grant(s): 23-319-03-01; Copyright; Avail.: CASI: A03, Hardcopy

The design, fabrication, and testing of a flexible, laminar, anisotropic piezoelectric composite actuator utilizing machined PMN-32%PT single crystal fibers is presented. The device consists of a layer of rectangular single crystal piezoelectric fibers in an epoxy matrix, packaged between interdigitated electrode polyimide films. Quasistatic free-strain measurements of the single crystal device are compared with measurements from geometrically identical specimens incorporating polycrystalline PZT-5A and PZT-5H piezoceramic fibers. Free-strain actuation of the single crystal actuator at low bipolar electric fields (+/- 250 V/mm) is approximately 400% greater than that of the baseline PZT-5A piezoceramic device, and 200% greater than that of the PZT-5H device. Free-strain actuation under high unipolar electric fields (0-4kV/mm) is approximately 200% of the PZT-5A baseline device, and 150% of the PZT-5H alternate piezoceramic device. Performance increases at low field are qualitatively consistent with predicted increases based on scaling the low-field d33 piezoelectric constants of the respective piezoelectric materials. High-field increases are much less than scaled d33 estimates, but appear consistent with high-field freestrain measurements reported for similar bulk single-crystal and piezoceramic compositions. Measurements of single crystal actuator capacitance and coupling coefficient are also provided. These properties were poorly predicted using scaled bulk material dielectric and coupling coefficient data. Rules-of-mixtures calculations of the effective elastic properties of the single crystal device and estimated actuation work energy densities are also presented. Results indicate longitudinal stiffnesses significantly lower (50% less) than either piezoceramic device. This suggests that single-crystal piezocomposite actuators will be best suited to low induced-stress, high strain and deflection applications.
Author
Epoxy Matrix Composites; Piezoelectric Ceramics; Actuators; Bipolarity; Estimates; Flux Density; Single Crystals

20080014257 NASA Langley Research Center, Hampton, VA, USA
Incorporation of Multiwalled Carbon Nanotubes into High Temperature Resin Using Dry Mixing Techniques
Ghose, Sayata; Watson, Kent A.; Delozier, Donavon M.; Working, Dennis C.; Siochi, Emilie J.; Connell, John W.; Composites Part A: Applied Science and Manufacturing; [2006]; Volume 37, No. 3, pp. 465-475; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-762-55-LA; Copyright; Avail.: CASI: A03, Hardcopy

As part of an ongoing effort to develop multifunctional advanced composites, blends of PETI330 and multiwalled carbon nanotubes (MWNTs) were prepared and characterized. Dry mixing techniques were employed and the maximum loading level of the MWNT chosen was based primarily on its effect on melt viscosity. The PETI330/ MWNT mixtures were prepared at concentrations ranging from 3 to 25 wt %. The resulting powders were characterized for homogeneity, thermal and rheological properties and extrudability as continuous fibers. Based on the characterization results, samples containing 10, 15 and 20 wt % MWNTs were chosen for more comprehensive evaluation. Samples were also prepared using in situ polymerization and solution mixing techniques and their properties were compared with the ball-mill prepared samples. The preparation and characterization of PETI330/ MWNT nanocomposites are discussed herein.
Author
Composite Materials; Carbon Nanotubes; Resins; High Temperature; Thermodynamic Properties; Viscosity

20080014260 Army Research Lab., Hampton, VA, USA
Testing and Life Prediction for Composite Rotor Hub Flexbeams
Murri, Gretchen B.; International Journal of Fatigue; September 13, 2004; Volume 28, No. 10, pp. 1124-1135; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23R-762-25-9195-01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014260

A summary of several studies of delamination in tapered composite laminates with internal ply-drops is presented. Initial studies used 2D FE models to calculate interlaminar stresses at the ply-ending locations in linear tapered laminates under

tension loading. Strain energy release rates for delamination in these laminates indicated that delamination would likely start at the juncture of the tapered and thin regions and grow unstably in both directions. Tests of glass/epoxy and graphite/epoxy linear tapered laminates under axial tension delaminated as predicted. Nonlinear tapered specimens were cut from a full-size helicopter rotor hub and were tested under combined constant axial tension and cyclic transverse bending loading to simulate the loading experienced by a rotorhub flexbeam in flight. For all the tested specimens, delamination began at the tip of the outermost dropped ply group and grew first toward the tapered region. A 2D FE model was created that duplicated the test flexbeam layup, geometry, and loading. Surface strains calculated by the model agreed very closely with the measured surface strains in the specimens. The delamination patterns observed in the tests were simulated in the model by releasing pairs of MPCs along those interfaces. Strain energy release rates associated with the delamination growth were calculated for several configurations and using two different FE analysis codes. Calculations from the codes agreed very closely. The strain energy release rate results were used with material characterization data to predict fatigue delamination onset lives for nonlinear tapered flexbeams with two different ply-dropping schemes. The predicted curves agreed well with the test data for each case studied.
Author
Graphite-Epoxy Composites; Hubs; Life (Durability); Rotary Wings; Laminates; Flexible Bodies; Delaminating; Beams (Supports); Full Scale Tests

20080014267 NASA Langley Research Center, Hampton, VA, USA
Processing and Properties of a Phenolic Composite System
Hou, Tan-Hung; Bai, J. M.; Baughman, James M.; Journal of Reinforced Plastics and Composites; [2006]; Volume 25, No. 5, pp. 495-506; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-064-30-35
Report No.(s): LAR-16877-1; Copyright; Avail.: CASI: A03, Hardcopy

Phenolic resin systems generate water as a reaction by-product via condensation reactions during curing at elevated temperatures. In the fabrication of fiber reinforced phenolic resin matrix composites, volatile management is crucial in producing void-free quality laminates. A commercial vacuum-bag moldable phenolic prepreg system was selected for this study. The traditional single-vacuum-bag (SVB) process was unable to manage the volatiles effectively, resulting in inferior voidy laminates. However, a double vacuum bag (DVB) process was shown to afford superior volatile management and consistently yielded void-free quality parts. The DVB process cure cycle (temperature /pressure profiles) for the selected composite system was designed, with the vacuum pressure application point carefully selected, to avoid excessive resin squeeze-outs and achieve the net shape and target resin content in the final consolidated laminate parts. Laminate consolidation quality was characterized by optical photomicrography for the cross sections and measurements of mechanical properties. A 40% increase in short beam shear strength, 30% greater flexural strength, 10% higher tensile and 18% higher compression strengths were obtained in composite laminates fabricated by the DVB process.
Author
Fabrication; Mechanical Properties; Phenolic Resins; Composite Materials; Vacuum Systems

20080014292 NASA Langley Research Center, Hampton, VA, USA
A Damage Model for the Simulation of Delamination in Advanced Composites under Variable-Mode Loading
Turon, A.; Camanho, P. P.; Costa, J.; Davila, C. G.; Mechanics of Materials; [2006]; Volume 38, No. 11, pp. 1072-1089; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-719-20-40-10; Copyright; Avail.: CASI: A04, Hardcopy

A thermodynamically consistent damage model is proposed for the simulation of progressive delamination in composite materials under variable-mode ratio. The model is formulated in the context of Damage Mechanics. A novel constitutive equation is developed to model the initiation and propagation of delamination. A delamination initiation criterion is proposed to assure that the formulation can account for changes in the loading mode in a thermodynamically consistent way. The formulation accounts for crack closure effects to avoid interfacial penetration of two adjacent layers after complete decohesion. The model is implemented in a finite element formulation, and the numerical predictions are compared with experimental results obtained in both composite test specimens and structural components.
Author
Delaminating; Composite Structures; Composite Materials; Numerical Analysis; Predictions; Simulation; Finite Element Method

20080014341 NASA Langley Research Center, Hampton, VA, USA

High Temperature Resin/Carbon Nanotube Composite Fabrication

Ghose, Sayata; Watson, Kent A.; Sun, Keun J.; Criss, Jim M.; Siochi, Emilie J.; Connell, John W.; January 2005; 25 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): 23-064-50-10; Copyright; Avail.: CASI: A03, Hardcopy

For the purpose of incorporating multifunctionality into advanced composites, blends of phenylethynyl terminated imides-330 (PETI-330) and multi-walled carbon nanotubes (MWCNTs) were prepared, characterized and fabricated into moldings. PETI-330/MWCNT mixtures were prepared at concentrations ranging from 3 to 25 weight percent by dry mixing the components in a ball mill. The resulting powders were characterized for degree of mixing, thermal and rheological properties. Based on the characterization results, PETI-330/MWCNT samples were scaled up to approximately 300 g and used to fabricate moldings by injecting the mixtures at 260-280 deg C into a stainless steel tool followed by curing for 1 h at 371 deg C. The tool was designed to impart a degree of shear during the injection process in an attempt to achieve some alignment of the MWCNTs in the flow direction. Obtained moldings were subsequently characterized for thermal, mechanical, and electrical properties. The degree of dispersion and alignment of MWCNTs were investigated using high-resolution scanning electron microscopy. The preparation and preliminary characterization of PETI-330/MWCNT composites will be discussed. Author (revised)

High Temperature; Resins; Carbon Nanotubes; Polymer Matrix Composites; Nanocomposites; Fabrication; Imides; Injection Molding

20080014531 Naval Postgraduate School, Monterey, CA USA

Continuum Modeling of Interface Failure

Griffiths, Robert P; Dec 2007; 55 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476040; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476040

Two-dimensional continuum modeling and simulations were conducted to predict how the size, quantity, and stiffness of reinforcing particles such as carbon nanotubes (CNTs) affect failure mechanisms at the interface of composite structures. First, the strength model used the finite element method (FEM) on a slender composite beam with step-joint containing reinforcing particles to predict its critical stress-strain behavior at the joint interface under compressive axial load. Next, the fracture mechanics model used the virtual crack extension method on the same composite beam containing an internal crack to predict how the energy release rate was affected by reinforcing particles at the interface under the same compressive axial load. Comparing the two results to experimental data showed that the fracture mechanics model predicted the interface failure behavior better than the strength model. Finally, the fracture mechanics model was used for a composite plate containing an edge crack to study how the energy release rate was affected by several parameters of reinforcing particles near the crack tip under transverse shear load. In each case, homogeneous models served as baselines for comparative analyses. Outcome of this work not only represents reliable and efficient modeling of composite interfaces in order to improve failure strength through the addition of nanoscale reinforcing particles such as CNTs but also serves to focus future research in structural application of CNTs, especially within testing and evaluation of CNTs in composite scarf-joint interfaces.

DTIC

Composite Structures; Continuum Modeling; Failure

20080014541 Koo and Associates International, Inc., Austin, TX USA

Nanomodified Carbon/Carbon Composites for Intermediate Temperature

Koo, J H; Pilato, L A; Wissler, G E; Aug 31, 2007; 53 pp.; In English

Contract(s)/Grant(s): FA9550-05-C-0028

Report No.(s): AD-A476055; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476055

An improved Carbon/Carbon Composite (CCC) with enhanced thermo-oxidative resistant performance at intermediate temperatures (371 to 650 C) is being developed. A nanophase is introduced into the CCC prior to cure for improved and maintained mechanical strength by preventing oxidation of the CCC. Four material systems based on Lonza PT-15 cyanate ester (CE) resin and selected nanoparticles were chosen to produce prepregs. They were fabricated into composites for carbonization and densification to produce nanomodified CCC using CVI process. Two sets of 30.48 by 30.48 by 0.38 cm NCCC panels were fabricated. Ten material systems based on synthetic AR mesophase pitch and silicon carbide nanoparticles in two groups were also selected to produce CCC using the SMJ patented in-situ polymerization method. Two sets of 15.25 by 15.25 by 0.32 cm CCC panels were fabricated for these two groups. A C/C and a C/SiC type composites fabricated by

DACC of Korea were included for comparison. Microstructure analyses of pre- and post-test CCC specimens using SEM and optical microscopy provided more fundamental understanding of material behavior. The nanomodified CE CCC (PT15/30B, PT15/Im and PT15/P0SS) are more thermo-oxidative resistant than the baseline CCC (PT15). With TGA for heat soaking in air environment, the DACC C/SiC composite exhibited the best performance and the AR mesophase pitch/SiC impregnated with Ceraset (trademark) exhibited the most thermo-oxidative resistant NCCC. It was followed by the AR mesophase pitch/SiC NCCC. The nanomodified PT-15 CE NCCC is the most unfavorable of the three NCCC groups. The density of the NCCC and the percentage loading of SiC nanoparticles appear to be the most important factors determining the thermo-oxidative properties of NCCC within the same group.
DTIC
Carbon-Carbon Composites; Cyanates; Nanostructures (Devices); Oxidation Resistance

20080014656 Materials Sciences Corp., Fort Washington, PA USA
Progressive Failure Analysis of Thin Walled Composite Tubes Under Low Energy Impact
Yen, Chian-Fong; Cassin, Thomas; Patterson, Joel; Triplett, Matt; Jan 2007; 10 pp.; In English
Report No.(s): AD-A476127; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Composite failure criteria have been developed for dynamic analysis of composite structures. The proposed progressive failure criteria have been integrated into an explicit dynamic analysis code for failure prediction of thin composite tubes subjected to drop weight impact tests. The results provide good correlation with experimental data for impact force histories and some critical damage modes.
DTIC
Composite Structures; Damage; Failure; Failure Analysis; Fiber Composites; Pipes (Tubes)

20080014803 NASA Langley Research Center, Hampton, VA, USA
Fabrication and Characterization of High Temperature Resin/Carbon Nanofiber Composites
Ghose, Sayata; Watson, Kent A.; Working, Dennis C.; Criss, Jim M.; Siochi, Emilie J.; Connell, John W.; High Performance Polymers; January 2005; Volume 18, No. 4, pp. 527-544; In English
Contract(s)/Grant(s): 23-064-50-10
Report No.(s): LAR-17082-1; Copyright; Avail.: CASI: A03, Hardcopy
Multifunctional composites present a route to structural weight reduction. Nanoparticles such as carbon nanofibers (CNF) provide a compromise as a lower cost nanosize reinforcement that yields a desirable combination of properties. Blends of PETI-330 and CNFs were prepared and characterized to investigate the potential of CNF composites as a high performance structural medium. Dry mixing techniques were employed and the effect of CNF loading level on melt viscosity was determined. The resulting powders were characterized for degree of mixing, thermal and rheological properties. Based on the characterization results, samples containing 30 and 40 wt% CNF were scaled up to approx.300 g and used to fabricate moldings 10.2 cm x 15.2 cm x 0.32 cm thick. The moldings were fabricated by injecting the mixtures at 260-280 C into a stainless steel tool followed by curing for 1 h at 371 C. The tool was designed to impart high shear during the process in an attempt to achieve some alignment of CNFs in the flow direction. Moldings were obtained that were subsequently characterized for thermal, mechanical and electrical properties. The degree of dispersion and alignment of CNFs were investigated using high-resolution scanning electron microscopy. The preparation and preliminary characterization of PETI-330/CNF composites are discussed. Keywords: resins, carbon nanofibers, scanning electron microscopy, electrical properties, thermal conductivity,injection
Author
Nanoparticles; Fabrication; Characterization; Thermodynamic Properties; Carbon; Resins; High Temperature; Scanning Electron Microscopy; Electrical Properties

20080014804 NASA Langley Research Center, Hampton, VA, USA
Carbon Nanotube/Polymer Nanocomposites Flexible Stress and Strain Sensors
Kang, Jin Ho; Sauti, Godfrey; Park, Cheol; Scholl, Jonathan A.; Lowther, Sharon E.; Harrison, Joycelyn S.; March 24, 2008; 23 pp.; In English; Material Research Society (MRS) 2008 Spring Meeting, 24-28 Mar. 2008, San Francisco, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 659877.02.07.9S39.02; Copyright; Avail.: CASI: A03, Hardcopy
Conformable stress and strain sensors are required for monitoring the integrity of airframe structures as well as for sensing the mechanical stimuli in prosthetic arms. For this purpose, we have developed a series of piezoresistive single-wall carbon

nanotube (SWCNT)/polymer nanocomposites. The electromechanical coupling of pressure with resistance changes in these nanocomposites is exceptionally greater than that of metallic piezoresistive materials. In fact, the piezoresistive stress coefficient (pi) of a SWCNT/polymer nanocomposite is approximately two orders of magnitude higher than that of a typical metallic piezoresistive. The piezoresistive stress coefficient is a function of the nanotube concentration wherein the maximum value occurs at a concentration just above the percolation threshold concentration (phi approx. 0.05 %). This response appears to originate from a change in intrinsic resistivity under compression/tension. A systematic study of the effect of the modulus of the polymer matrix on piezoresistivity allowed us to make flexible and conformable sensors for biomedical applications. The prototype haptic sensors using these nanocomposites are demonstrated. The piezocapacitive properties of SWCNT/polymer are also characterized by monitoring the capacitance change under pressure.
Author
Carbon Nanotubes; Polymer Matrix Composites; Nanocomposites; Stress-Strain Relationships; Aircraft Structures; Airframes; Electrical Resistivity

20080014852 National Inst. of Aerospace, Hampton, VA, USA
Thermal Conductivity of Polyimide/Carbon Nanofiller Blends
Delozier, D. M.; Watson, K. A.; Ghose, S.; Working, D. C.; Connell, J. W.; Smith, J. G.; Sun, Y. P.; Lin, Y.; June 16, 2006; 9 pp.; In English; Carbon 2006-The International Carbon Conference, 16-21 Jul. 2006, Aberdeen, UK; Original contains black and white illustrations
Contract(s)/Grant(s): 984754.02.07.07; Copyright; Avail.: CASI: A02, Hardcopy

Ultem(TM) was mixed with three different carbon-based nanofillers in efforts to increase the thermal conductivity of the polymer. After initial mixing, the nanocomposites were extruded or processed via the Laboratory Mixing Molder (LMM) process. High resolution scanning electron microscopy (HRSEM) revealed significant alignment of the nanofillers in the extruded samples. Thermal conductivity measurements were made both in the direction and perpendicular to the direction of alignment of nanofillers as well as for unaligned samples. It was found that the largest improvement in thermal conductivity was achieved in the case of aligned samples when the measurement was performed in the direction of alignment. Unaligned samples also showed a significant improvement in thermal conductivity and may be useful in applications when it is not possible to align the nanofiller. However the improvements in thermal conductivity did not approach those expected based on a rule of mixtures. This is likely due to poor phonon transfer through the matrix.
Derived from text
Carbon Compounds; Nanocomposites; Polyimides; Thermal Conductivity; Fillers

20080015398 Army Research Lab., Hampton, VA, USA
Influence of Compression and Shear on the Strength of Composite Laminates with Z-Pinned Reinforcement
O'Brien, T. Kevin; Krueger, Ronald; January 2005; 15 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DAAH10-02-2-0001; Copyright; Avail.: CASI: A03, Hardcopy

The influence of compression and shear loads on the strength of composite laminates with z-pins is evaluated parametrically using a 2D Finite Element Code (FLASH) based on Cosserat couple stress theory. Meshes were generated for three unique combinations of z-pin diameter and density. A laminated plate theory analysis was performed on several layups to determine the bi-axial stresses in the zero degree plies. These stresses, in turn, were used to determine the magnitude of the relative load steps prescribed in the FLASH analyses. Results indicated that increasing pin density was more detrimental to in-plane compression strength than increasing pin diameter. Compression strengths of lamina without z-pins agreed well with a closed form expression derived by Budiansky and Fleck. FLASH results for lamina with z-pins were consistent with the closed form results, and FLASH results without z-pins, if the initial fiber waviness due to z-pin insertion was added to the fiber waviness in the material to yield a total misalignment. Addition of 10% shear to the compression loading significantly reduced the lamina strength compared to pure compression loading. Addition of 50% shear to the compression indicated shear yielding rather than kink band formation as the likely failure mode. Two different stiffener reinforced skin configurations with z-pins, one quaiisotropic and one orthotropic, were also analyzed. Six unique loading cases ranging from pure compression to compression plus 50% shear were analyzed assuming material fiber waviness misalignment angles of 0, 1, and 2 degrees. Compression strength decreased with increased shear loading for both configurations, with the quasi-isotropic configuration yielding lower strengths than the orthotropic configuration.
Author
Compression Loads; Laminates; Plates (Structural Members); Shear Strength; Finite Element Method; Failure Modes; Compressive Strength; Pins

20080015424 General Motors Research Labs., Warren, MI, USA; NASA Langley Research Center, Hampton, VA, USA
Finite Element Analysis of Adaptive-Stiffening and Shape-Control SMA Hybrid Composites
Gao, Xiujie; Burton, Deborah; Turner, Travis L.; Brinson, Catherine; January 2005; 19 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Shape memory alloy hybrid composites with adaptive-stiffening or morphing functions are simulated using finite element analysis. The composite structure is a laminated fiber-polymer composite beam with embedded SMA ribbons at various positions with respect to the neutral axis of the beam. Adaptive stiffening or morphing is activated via selective resistance heating of the SMA ribbons or uniform thermal loads on the beam. The thermomechanical behavior of these composites was simulated in ABAQUS using user-defined SMA elements. The examples demonstrate the usefulness of the methods for the design and simulation of SMA hybrid composites. Keywords: shape memory alloys, Nitinol, ABAQUS, finite element analysis, post-buckling control, shape control, deflection control, adaptive stiffening, morphing, constitutive modeling, user element

Author

Shape Memory Alloys; Composite Structures; Laminates; Nitinol Alloys; Finite Element Method; Fiber Composites; Buckling; Shape Control

20080015439 NASA Langley Research Center, Hampton, VA, USA
An Approach to Assess Delamination Propagation Simulation Capabilities in Commercial Finite Element Codes
Krueger, Ronald; April 2008; 71 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 698259.02.07.07.03.03
Report No.(s): NASA/TM-2008-215123; L-19452; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015439

An approach for assessing the delamination propagation simulation capabilities in commercial finite element codes is presented and demonstrated. For this investigation, the Double Cantilever Beam (DCB) specimen and the Single Leg Bending (SLB) specimen were chosen for full three-dimensional finite element simulations. First, benchmark results were created for both specimens. Second, starting from an initially straight front, the delamination was allowed to propagate. The load-displacement relationship and the total strain energy obtained from the propagation analysis results and the benchmark results were compared and good agreements could be achieved by selecting the appropriate input parameters. Selecting the appropriate input parameters, however, was not straightforward and often required an iterative procedure. Qualitatively, the delamination front computed for the DCB specimen did not take the shape of a curved front as expected. However, the analysis of the SLB specimen yielded a curved front as was expected from the distribution of the energy release rate and the failure index across the width of the specimen. Overall, the results are encouraging but further assessment on a structural level is required.

Author

Delaminating; Finite Element Method; Loads (Forces); Fracture Mechanics; Cantilever Beams; Failure; Bending; Composite Materials

20080015564 National Inst. of Aerospace, Hampton, VA, USA
Modeling of Interfacial Modification Effects on Thermal Conductivity of Carbon Nanotube Composites
Clancy, Thomas C.; Gates, Thomas S.; January 2006; 29 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 732759.07.11; Copyright; Avail.: CASI: A03, Hardcopy

The effect of functionalization of carbon nanotubes on the thermal conductivity of nanocomposites has been studied using a multi-scale modeling approach. These results predict that grafting linear hydrocarbon chains to the surface of a single wall carbon nanotube with covalent chemical bonds should result in a significant increase in the thermal conductivity of these nanocomposites. This is due to the decrease in the interfacial thermal (Kapitza) resistance between the single wall carbon nanotube and the surrounding polymer matrix upon chemical functionalization. The nanocomposites studied here consist of single wall carbon nanotubes in a bulk poly(ethylene vinyl acetate) matrix. The nanotubes are functionalized by end-grafting linear hydrocarbon chains of varying length to the surface of the nanotube. The effect which this functionalization has on the interfacial thermal resistance is studied by molecular dynamics simulation. Interfacial thermal resistance values are calculated for a range of chemical grafting densities and with several chain lengths. These results are subsequently used in an analytical model to predict the resulting effect on the bulk thermal conductivity of the nanocomposite.

Author

Thermal Conductivity; Nanocomposites; Carbon Nanotubes; Covalent Bonds; Grafting; Mathematical Models; Hydrocarbons; Kapitza Resistance

25
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*.

20080014433 Indian Inst. of Science, Bangalore, India
Electrochemical Investigations of the Interface at Li/Li+ Ion Conducting Channel (Supplemental)
Nookala, Munichandraiah; Nov 7, 2007; 2 pp.; In English
Contract(s)/Grant(s): FA5209-06-P-0156
Report No.(s): AD-A475807; IIS-054090; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475807

Studies were undertaken to examine the effect of substrate materials on impedance behaviour of lithium dipthalocyanine (Li2Pc). Several symmetrical cells were assembled using stainless steel (SS), gold foil, gold sputtered SS, copper, nickel and lithium electrodes. It was found that the Nyquist impedance spectrum obtained with SS electrodes consisted of two semicircles with total resistance of 1700 kOhm. But the cell with gold electrodes produced a single semicircle with resistance of 450 kOhm. Similarly, different values of impedance were obtained by varying the substrate materials. It was concluded that Li2Pc exhibits chemical reactivity with metallic substrates used in the study.
DTIC
Computers; Electrolytic Cells; Laboratory Equipment

20080014462 Naval Postgraduate School, Monterey, CA USA
Thrust Measurement of a Split-Path, Valveless Pulse Detonation Engine
Bartosh, Brady J; Dec 2007; 115 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475868; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475868

Theory predicts ideal pulse detonation technology offers significant fuel efficiency advantages over ramjet/scramjet architecture within a range from high subsonic to low hypersonic velocities. In practice, Pulse Detonation Engines (PDE) require implementation of loss-inducing techniques such as turbulence-generation devices to achieve and sustain detonation events, which effectively narrows the efficiency gap between the two technologies. Pressure losses associated with such obstacles lower system specific thrust (Isp) and reduce overall system performance. Although fundamental PDE research has been ongoing at NPS for seven years, no dedicated attempt has been made to accurately measure the experimental performance. Fuel-based Isp is a function of the ratio of thrust produced to fuel mass flow rate; thus, accurate computation requires precise knowledge of both thrust and input fuel. This thesis focused on creating an accurate thrust collection system incorporating an existing, uncalibrated rocket thrust stand. An in depth, axial component thrust calibration was conducted for the stand itself, then with the engine mounted in the firing configuration. As expected, harmonic responses of the stand during detonation experimentation were experienced which required creation and implementation of filtering algorithms to successfully extract useful thrust values.
DTIC
Pulse Detonation Engines; Thrust Measurement

20080014666 Wright State Univ., Dayton, OH USA
Simulating Magneto-Aerodynamic Actuator
Shang, Joseph J; Dec 20, 2007; 29 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0164
Report No.(s): AD-A476149; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A hypersonic flow control by amplifying an electromagnetic perturbation through viscous-inviscid interaction has been developed and verified by experimental observations. The electromagnetic perturbation is generated by a near-surface direct current discharge. The Joule heating and Lorentz acceleration induce an oblique shock over the localized plasma domain and produce a high-pressure plateau for flow control. The interdisciplinary phenomenon has been successfully simulated by solving the three-dimensional, magneto-fluid-dynamic equations with a weakly ionized gas model based on the drift-diffusion theory. The side-by-side computational and experimental research effort has demonstrated that the magneto-fluid- dynamic

interaction is an innovative and effective mechanism of the virtual leading edge strake and virtual variable cross-sectional area inlet cowls for hypersonic flow control. Technology transfer has also been accomplished through personal interaction with personnel of Air Force Research Laboratory and NASA National Aerospace Institute.
DTIC
Actuators; Gas-Solid Interactions; Simulation; Surface Reactions

20080014717 Rice Univ., Houston, TX USA
Foam Delivery of Hydrogen for Enhanced Aquifer Contacting and Anaerobic Bioremediation of Chlorinated Solvents
Hirasaki, George J; Hughes, Joseph B; Miller, Clarence A; Nov 2005; 163 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DACA72-01-C-0021
Report No.(s): AD-A476343; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hydrogen biosparging of aquifers contaminated with chlorinated solvents is promising as a method to enhance in situ microbial dechlorination. The major problem is the inability to distribute hydrogen throughout the contaminated interval such that complete dechlorination can occur. Foam is a dispersion of gas in water that is stabilized from coalescence by the presence of a low concentration of surfactants. A promising method to greatly extend the horizontal migration of hydrogen in the subsurface is to deliver the hydrogen as an 'in situ generated foam'. In this report, we investigated the role of foam in hydrogen biosparging for aquifer remediation.
DTIC
Aquifers; Chlorination; Foams; Hydrogen; Solvents

20080014862 NASA Langley Research Center, Hampton, VA, USA
Low Temperature Measurements of HCN Broadened by N2 in the 14-micron Spectral Region
Smith, M. A. H.; Rinsland, C. P.; Blake, T. A.; Sams, R. L.; Benner, D. Chris; Devi, V. Malathy; January 2007; 50 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DE-AC06-76RLO 1830; WBS 811073.02.01.01.22; Copyright; Avail.: Other Sources

Half width and pressure-induced shift coefficients, the temperature dependence exponents of the half widths and the temperature dependence coefficients of pressure-induced shifts have been measured for N2-broadened transitions in the nu(sub 2) band of HCN from analysis of high-resolution spectra recorded with two different Fourier transform spectrometers. A total of 34 laboratory absorption spectra recorded at 0.002-0.005/cm resolution, at total pressures up to nearly 1 atm and at temperatures between 211 and 300 K, were used in the determination of the spectral line parameters. A multispectrum nonlinear least squares curve fitting technique employing a modified Voigt line profile, including speed dependence and line mixing via the off-diagonal relaxation matrix formulation, was used in the analysis. Speed dependence parameters were determined in the P and R branches, and in the Q branches the off-diagonal relaxation matrix elements that characterize line mixing were included in the analysis to fit the data. Present results are compared to previous measurements reported in the literature. Key words: HCN, Lorentz N2 broadening, N2 pressure-induced shifts, relaxation matrix elements, speed dependence, temperature dependence
Author
Temperature Dependence; Pressure Dependence; Nitrogen; Spectrum Analysis; Coefficients; Absorption Spectra; Fourier Transformation; Pressure Ratio

20080015376 Air Force Research Lab., Wright-Patterson AFB, OH USA
Advances in High-Fidelity Multi-Physics Simulation Techniques
Gaitonde, Datta; Josyula, Eswar; Visbal, Miguel; Jan 2008; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A03S
Report No.(s): AD-A476015; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476015

Efforts performed under this task to evolve a high-fidelity methodology for multi-physics applications in all speed regimes are summarized. Among the disciplines considered are fluid dynamics (turbulence, acoustics), electromagnetics, magnetogasdynamics, aero-structural interactions and thermo-chemical nonequilibrium. For high-order accuracy, a compact-difference based method is developed, supplemented by a filtering procedure to guarantee numerical stability in the presence of boundary truncation, stretching and non-linearity. The filter is also shown to be suitable for sub-grid closure within the high-order no-model large-eddy simulation. Further, boundary treatments for domain-decomposition techniques have also been developed. For high-temperature kinetics, accuracy is enforced through development and validation of master-equation

and extended Navier-Stokes approaches, which facilitate accounting of detailed energy transfers between vibrational, rotational and translational modes, and their impact on dissociation.
DTIC
Magnetohydrodynamics; Propulsion; Simulation; Thermochemistry

20080015408 Air Force Research Lab., Wright-Patterson AFB, OH USA
Magnesium Rich Primer for Chrome Free Protection of Aluminum Alloys (Preprint)
Johnson, Joel A; Dec 2007; 19 pp.; In English
Contract(s)/Grant(s): Proj-4347
Report No.(s): AD-A476101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hexavalent chromium compounds used for corrosion protection are one of the top hazardous waste materials generated by the U.S. Air Force and legislation is in effect to further restrict their use. Magnesium rich primers that utilize sacrificial magnesium metal pigment to cathodically protect aerospace aluminum alloy substrates are a potential alternative to chromated primers. This material has proven to be particularly effective as part of a completely chromate-free coating system in which a non film forming surface treatment and an Advanced Performance Coating (APC) grade topcoat are utilized. Samples using the latest advanced formulations show excellent corrosion protection of scribed AA2024-T3 panels in both ASTM B 177 and outdoor exposure at Dayton Beach, FL. Despite initial concerns regarding the reactivity of the magnesium metal pigment being used, the flammability and handling characteristics have not shown any potential problems to date. Transitioning a new class of corrosion protective primer coating such as this requires more testing than normal. The current Air Force plan involves qualification to a 'system level' coating specification, MIL-PRF-32239. In addition, simulated lap joints with various fasteners specific to the target aircraft will be evaluated, along with compatibility on alternative substrates and evaluation of coating reparability characteristics.
DTIC
Aluminum Alloys; Chromium; Chromium Compounds; Corrosion Prevention; Hazardous Materials; Hazardous Wastes; Magnesium; Protection

20080015552 Universal Energy Systems, Inc., Dayton, OH USA
Modelling Plasticity of Ni3Al-Based L12 Intermetallic Single Crystals. II. Two-Step (T1) and T2) Deformation Behaviour (Postprint)
Choi, Y S; Dimiduk, D M; Uchic, M D; Parthasarathy, T A; Oct 2007; 19 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5233; Proj-2311
Report No.(s): AD-A476335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The two-step (T1 and T2) deformation behaviour of Ni3Al-based single crystals was modelled under the framework of a new constitutive model proposed by Y.S. Choi, D.M. Dimiduk, M.D. Uchic, et al. [Phil. Mag. 87 1939 (2007)]. A new set of formulations and criteria, which identify thermally reversible and irreversible components of the constitutive variable a and define the relative significance of those components, was developed and implemented within the new constitutive framework. The simulation results well captured the general qualitative trends of the flow behaviour upon re-straining at T2 after pre-straining at T1 for both T1> T2 and T1< T2. Modelling results suggested that the dislocation substructures generated at T1 need to be treated as partially of fully transferable to plastic flow at T2, at least through the early stage of re-straining, to capture all major pre-strain effects. In particular, the large strengthening effect at T2 for even a few percent of pre-strain at T1 was obtainable only by controlling the availability of mobile dislocations and sources at T2.
DTIC
Aluminum Alloys; Deformation; Intermetallics; Nickel Alloys; Nickel Aluminides; Plastic Properties; Single Crystals

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METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20080014284 NASA Langley Research Center, Hampton, VA, USA
Electron Beam Freeform Fabrication Technology Development for Aerospace Applications
Taminger, Karen M.; April 06, 2006; 20 pp.; In English; Airbus/NIA Materials & Structures Workshop, 6-7 Apr. 2006, Hampton, VA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 561581.02.08.07; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014284

NASA Langley has developed a the EBF(sup 3)process and currently has two EBF(sup 3) systems in house. EBF(sup 3)

process offers potential cost reduction and fabrication of complex unitized structures out of metals. EBF(sup 3) has been successfully demonstrated on Al, Al-Li, Ti, and Ni alloys to date.
Derived from text
Electron Beams; Fabrication; Aluminum Alloys; Titanium Alloys; Lithium Alloys; Nickel Alloys; Metals; Aerospace Engineering

20080014302 NASA Langley Research Center, Hampton, VA, USA
Modeling of the Temperature-dependent Spectral Response of In(1-x)Ga(x)Sb Infrared Photodetectors
Gonzalex-Cuevas, Juan A.; Refaat, Tamer F.; Abedin, M. Nurul; Elsayed-Ali, Hani E.; Optical Engineering; [2006]; Volume 45, No. 4,044001, pp. 1-8; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-090-20-II; Copyright; Avail.: CASI: A03, Hardcopy

A model of the spectral responsivity of In(1-x) Ga(x) Sb p-n junction infrared photodetectors has been developed. This model is based on calculations of the photogenerated and diffusion currents in the device. Expressions for the carrier mobilities, absorption coefficient and normal-incidence reflectivity as a function of temperature were derived from extensions made to Adachi and Caughey-Thomas models. Contributions from the Auger recombination mechanism, which increase with a rise in temperature, have also been considered. The responsivity was evaluated for different doping levels, diffusion depths, operating temperatures, and photon energies. Parameters calculated from the model were compared with available experimental data, and good agreement was obtained. These theoretical calculations help to better understand the electro-optical behavior of In(1-x) Ga(x) Sb photodetectors, and can be utilized for performance enhancement through optimization of the device structure.
Author
Electro-Optics; Infrared Radiation; P-N Junctions; Photometers; Spectral Sensitivity; Temperature Dependence; Ternary Alloys; Mathematical Models; Indium Antimonides; Gallium Antimonides

20080014417 Naval Postgraduate School, Monterey, CA USA
Effects of Strain Path on the Microstructure of Aluminum Alloys During Equal Channel Angular Pressing (ECAP)
Houston, Katrina M; Dec 2007; 71 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-F1ATA06058G001
Report No.(s): AD-A475774; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475774

Aluminum alloys AA1050 and AA6061 were processed by ECAP following either monotonic or redundant routes. The materials were characterized by optical microscopy and orientation imaging microscopy. Grain shape changes were analyzed in different billet planes to assess microstructure refinement mechanisms and were consistent with a proposed model. The results demonstrate that microstructure development is not independent of processing route. In the case of AA6061, annealing characteristics were examined to determine if the material has the requisite properties typically exhibited by a superplastic material. Recommendations are made for future research. This work was funded in part by the Air Force Office of Scientific Research (AFOSR) under contract number F1ATA06058G001.
DTIC
Aluminum Alloys; Microstructure; Theses

20080014517 Naval Postgraduate School, Monterey, CA USA
The 'Lazy S' Feature in Friction Stir Welding of AA2099 Aluminum -Lithium Alloy
Klages, Holli K; Dec 2007; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476009; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476009

The addition of Lithium to Aluminum-Lithium (Al-Li) alloys results in reduced density as well as increased stiffness and strength, and so these materials are attractive for selected aerospace structures. Friction Stir Welding (FSW) of Al-Li alloys may provide high join efficiency in such structures but potential FSW defects must be understood. This thesis examines the occurrence of the 'Lazy S: feature, which may be a defect. Welds were made after various treatments of the faying surfaces and with different FSW procedures. These welds were examined and their microstructures were characterized by optical microscopy and orientation imaging microscopy. Microhardness data were acquired as well. The Lazy S feature arises as the

faying surfaces are deformed and spread out during FSW. Inadequate bonding along these surfaces will constitute a weld defect.
DTIC
Aluminum Alloys; Friction Stir Welding; Lithium Alloys; Welding

20080014546 Dayton Univ., OH USA
Navy High-Strength Steel Corrosion-Fatigue Modeling Program
Hoppe, Wally; Scott, Ollie; Braisted, Bill; Abfalter, Garry; Pierce, Jennifer; Burke, Eric; Kuhlman, Sarah; Frock, Brian; Ko, Ray; Oct 2006; 295 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F42620-00-D-0039-0011
Report No.(s): AD-A476065; UDR-TR-2007-00039; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476065

The High-Strength Steel Corrosion-Fatigue Assessment program was designed to ensure reliability and supportability of current and emerging Naval aircraft by providing requisite engineering support to evaluate issues relevant to corrosion-fatigue of aircraft components. In this multi-year, multi-contract program, tools have been developed to assist in the establishment of maintenance options for corroded components. Experimental and analytical tools have been developed to classify corrosion in a manner tied to a reduction in fatigue life, to assess corrosion classifications by corrosion metrics, to measure these metrics with nondestructive methods, and to model the effect of corrosion on fatigue life. This report describes the work accomplished during the first two years and first contract of the program.
DTIC
Classifications; Corrosion; High Strength Steels; Metal Fatigue; Navy; Steels

20080014679 CSA Engineering, Inc., Albuquerque, NM USA
Experimental and Numerical Identification of a Monolithic Articulated Concentrated Strain Elastic Structure's (MACSES's) Properties
Pollard, Eric L; Murphey, Thomas W; Sanford, Gregory E; Apr 2007; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476203; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this research is to identify the effective continuum properties of a recently developed, deployable hierarchical truss architecture composed of carbon fiber reinforced plastic (CFRP) tubes and CFRP tape-spring hinge elements with embedded shape memory alloy (SMA) flexures; this particular structural system is referred to as monolithic articulated concentrated strain elastic structure (MACSES) and is representative of a concentrated, material deformation based deployable architecture. The scope of this study encompasses numerically and experimentally identifying the deployed stiffness and strength performance, i.e., bending, shear, torsion, and axial moduli with corresponding critical loads, of a 540 mm radius boom. Bending modulus to linear mass ratio was measured at 145 kNm3kg-1. Of particular interest were the sensitivity of joint composition to global properties and the acceptability of discontinuous load-paths. Developmental aspects of the MACSES architecture, including the concept at the individual element level, the packaging kinematics design, and evaluation and scaling the global performance of the system are reported in a preceding manuscript.
DTIC
Carbon Fiber Reinforced Plastics; Elastic Properties; Shape Memory Alloys

20080015548 NASA Glenn Research Center, Cleveland, OH, USA
Strength, Fatigue, and Fracture Toughness of Ti-6Al-4V Liner from a Composite Over-Wrapped Pressure Vessel
Salem, Jonathan A.; Lerch, Brad; Thesken, John C.; Sutter, Jim; Russell, Richard; March 2008; 33 pp.; In English; Aging Aircraft 2008, 21-24 April 2008, Phoenix, AZ, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 981155.01.03.04
Report No.(s): NASA/TM-2008-215147; E-16307; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015548

It was demonstrated by way of experiment that Composite Over-wrapped Pressure Vessel (COPV) Ti-6Al-4V liner material can sustain the expected service loads and cycles. The experiments were performed as part of investigations on the residual life of COPV tanks being used in Space Shuttle Orbiters. Measured properties included tensile strength, compressive strength, reversed loading cycles to simulate liner proof strains, and cyclic fatigue loading to demonstrate the ability to sustain 1000 cycles after liner buckling. The liner material came from a salvaged 40 in. Columbia (orbiter 102) tank (SN029), and tensile strength measurements were made on both boss-transition (thick) and membrane regions (thin). The average measured

yield strength was 131 ksi in the boss-transition and membrane regions, in good agreement with measurements made on 1970 s vintage forged plate stock. However, Young s modulus was 17.4+/-0.3 Msi, somewhat higher than typical handbook values (approx.16 Msi). The fracture toughness, as estimated from a failed fatigue specimen, was 74 ksi/sq in, in reasonable agreement with standardized measurements made on 1970 s vintage forged plate stock. Low cycle fatigue of a buckled test specimen implied that as-imprinted liners can sustain over 4000 load cycles.
Author
Fracture Strength; Fatigue (Materials); Modulus of Elasticity; Titanium Alloys; Vanadium Alloys; Aluminum Alloys; Yield Strength; Compressive Strength; Pressure Vessels

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*.

20080014338 NASA Langley Research Center, Hampton, VA, USA
Investigation of Aromatic/Aliphatic Polyimides as Dispersants for Single Wall Carbon Nanotubes
Delozier, Donavon M.; Watson, Kent A.; Smith, Joseph G., Jr.; Clancy, Thomas C.; Connell, John W.; Macromolecules; [2006]; Volume 39, No. 5, pp. 1731-1739; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-612-20-07-12
Report No.(s): LAR-16874-1; Copyright; Avail.: CASI: A03, Hardcopy

Novel aromatic/aliphatic polyimides were prepared from 2,7-diamino-9,9'- dioctylfluorene (AFDA) and aromatic dianhydrides. Upon investigating the effectiveness of these polyimides for dispersing single wall carbon nanotubes (SWNTs) in solution, three were discovered to disperse SWNTs in N,N-dimethylacetamide (DMAc). Two of these polyimides, one from 3,3',4,4'-oxydiphthalic anhydride (ODPA) and one from symmetric 3,3',4,4'-biphenyltetracarboxylic dianhydride (s-BPDA), were used to prepare nanocomposites. Homogeneous polyimide/SWNT suspensions from both polymers were used in the preparation of films and fibers containing up to 1 wt% SWNTs. The samples were thermally treated to remove residual solvent and the films were characterized for SWNT dispersion by optical and high resolution scanning electron microscopy (HRSEM). Electrical and mechanical properties of the films were also determined. Electrospun fibers were examined by HRSEM to characterize SWNT alignment and orientation.
Author
Polyimides; Diamines; Dispersing; High Polymers; Anhydrides; Carbon Nanotubes; Nanocomposites

20080014434 Naval Research Lab., Washington, DC USA
Preparation of Ultra Thin Polystyrene, Polypropylene and Polyethylene Films on Si Substrate Using Spin Coating Technology
Lock, Evgeniya; Walton, Scott; Fernsler, Richard; Jan 4, 2008; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-67-7641-08
Report No.(s): AD-A475808; NRL/MR/6750--08-9092; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475808

Preparation of ultra thin polystyrene, polypropylene and polyethylene films on silicon substrate using the spin coating technique is discussed in this report. The influence of various process parameters on the obtained film quality including Si wafer preparation, choice of solvent, influence of the solution concentration on the coating and sample positioning on the spin coater are shown. The polymer film surface morphology, thickness and chemical composition were analyzed by atomic force microscopy, profilometery, n&k spectrometry, ellipsometry and X-ray photoelectron spectrometry. Contact angle measurements were performed to characterize the polymer surface energy.
DTIC
Coating; Polyethylenes; Polypropylene; Polystyrene; Substrates; Thin Films

20080014452 Naval Postgraduate School, Monterey, CA USA
Solving the Principal - Agent Problem in Iraq: Economic Incentives Create a New Model for Security
Cole, Verlan R; Cramer, Jayson L; Hollingsworth, L S; Dec 2007; 133 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475849; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475849

This report evaluates several alternatives that could be used to form a public policy in Iraq for sharing oil revenues with

the Iraqi people. Using the Alaska Permanent Fund dividend as a potential model for Iraq, two key criteria were formulated for comparison and contrast with other alternatives currently available to the Iraqi government. The evaluative criteria were: does the model distribute wealth to the people and does it encourage increased security and stability to protect that means of wealth distribution. The results of a cost-benefit analysis provide a means to evaluate oil distribution schemes and help form appropriate recommendations for Iraqi policy leaders.
DTIC
Cost Analysis; Economics; Incentives; Iraq; Oil Fields; Security

20080014509 Cortana Corp., Falls Church, VA USA
An Empirical Model-based MOE for Friction Reduction by Slot-Ejected Polymer Solutions in an Aqueous Environment
Pierce, John G; Dec 21, 2007; 58 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-C-0535
Report No.(s): AD-A475988; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475988

Since the discovery of the Toms Effect in 1948, many investigators have explored the nature and causes of polymer-induced friction reduction, using both experimental and theoretical methods. External friction reduction for use on submarines and other marine vehicles is an area of great practical importance. In such applications, the polymer must be ejected at one or more locations along the vehicle's exterior surface, so the effects of non-uniform polymer concentration are paramount. The goal of this work was to develop a model that accurately captures the drag-reduction behavior of slot-ejected polymer in external flow and that can be used as a measure of effectiveness (MOE) for engineering purposes. An empirical model has been developed by combining partial models from the work of earlier researchers. These model components were combined, using simple subsidiary calculations, to create a complete model of friction reduction as a function of the dimensionless parameter K. The complete model contains several empirical parameters from earlier published works and several operating parameters that define an experimental configuration. Each of the parameters was tested for its impact on the model. It was found that the model was very sensitive to three parameters in particular: the power law exponent that governs the approach to saturation as a function of polymer concentration, the ejection angle of the slot that extrudes the polymer into the flow, and the roll-off concentration at which performance decreases for high polymer concentrations. The model provides a useful MOE tool for evaluation of field experiments and for design of slot ejector systems.
DTIC
Drag Reduction; Friction Reduction; Polymers; Slots

20080014863 NASA Langley Research Center, Hampton, VA, USA
Processing Robustness for A Phenylethynyl Terminated Polyimide Composite
Hou, Tan-Hung; January 2004; 19 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-794-40-4G; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014863

The processability of a phenylethynyl terminated imide resin matrix (designated as PETI-5) composite is investigated. Unidirectional prepregs are made by coating an N-methylpyrrolidone solution of the amide acid oligomer (designated as PETAA-5/NMP) onto unsized IM7 fibers. Two batches of prepregs are used: one is made by NASA in-house, and the other is from an industrial source. The composite processing robustness is investigated with respect to the prepreg shelf life, the effect of B-staging conditions, and the optimal processing window. Prepreg rheology and open hole compression (OHC) strengths are found not to be affected by prolonged (i.e., up to 60 days) ambient storage. Rheological measurements indicate that the PETAA-5/NMP processability is only slightly affected over a wide range of B-stage temperatures from 250 deg C to 300 deg C. The OHC strength values are statistically indistinguishable among laminates consolidated using various B-staging conditions. An optimal processing window is established by means of the response surface methodology. IM7/PETAA-5/NMP prepreg is more sensitive to consolidation temperature than to pressure. A good consolidation is achievable at 371 deg C (700 deg F)/100 Psi, which yields an RT OHC strength of 62 Ksi. However, processability declines dramatically at temperatures below 350 deg C (662 deg F), as evidenced by the OHC strength values. The processability of the IM7/LARC(TM) PETI-5 prepreg was found to be robust.
Author
Polyimides; Resin Matrix Composites; Storage Stability; Degradation

20080015451 National Inst. of Aerospace, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA
Aligned Single Wall Carbon Nanotube Polymer Composites Using an Electric Field
Park, Cheol; Wiklinson, John; Banda, Sumanth; Ounaies, Zoubeida; Wise, Kristopher E.; Sauti, Godfrey; Lillehei, Peter T.; Harrison, Joycelyn S.; [2005]; 32 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NCC1-02037; Copyright; Avail.: CASI: A03, Hardcopy

While high shear alignment has been shown to improve the mechanical properties of single wall carbon nanotubes (SWNT)-polymer composites, it is difficult to control and often results in degradation of the electrical and dielectric properties of the composite. Here, we report a novel method to actively align SWNTs in a polymer matrix, which allows for control over the degree of alignment of SWNTs without the side effects of shear alignment. In this process, SWNTs are aligned via field-induced dipolar interactions among the nanotubes under an AC electric field in a liquid matrix followed by immobilization by photopolymerization while maintaining the electric field. Alignment of SWNTs was controlled as a function of magnitude, frequency, and application time of the applied electric field. The degree of SWNT alignment was assessed using optical microscopy and polarized Raman spectroscopy and the morphology of the aligned nanocomposites was investigated by high resolution scanning electron microscopy. The structure of the field induced aligned SWNTs is intrinsically different from that of shear aligned SWNTs. In the present work, SWNTs are not only aligned along the field, but also migrate laterally to form thick, aligned SWNT percolative columns between the electrodes. The actively aligned SWNTs amplify the electrical and dielectric properties in addition to improving the mechanical properties of the composite. All of these properties of the aligned nanocomposites exhibited anisotropic characteristics, which were controllable by tuning the applied field conditions. Author

Carbon Nanotubes; Polymer Matrix Composites; Electric Fields; Nanocomposites; Shear; Alignment; Reinforcement (Structures)

20080015515 Texas Univ., Austin, TX, USA; NASA Langley Research Center, Hampton, VA, USA
Stretch-Orientation of LaRC(TM) RP 50 Polyimide Film
Hawkins, Brian P.; Hinkley, Jeffrey A.; Pater, Ruth H.; Moore, Joanne; [2006]; 18 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

An addition-curable poly(amic acid) film was subjected to various thermal pretreatments and then to uniaxial or biaxial drawing. Hot-stretching to 300% of the initial length produced better than twofold increases in tensile modulus and strength of partially-cured films. Most of the improvement was maintained upon completion of the curing at constant length. Author

Polyimides; Tensile Strength; Pretreatment; Curing; Stretching

20080015551 Army Research Development and Engineering Command, Warren, MI USA
Computational Simulations of Interface Defeat
Templeton, Douglas; Holmquist, Timothy; Leavy, Brian; Dec 2002; 7 pp.; In English
Report No.(s): AD-A476328; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The widespread use of modeling and simulation for design of armor systems is critically dependent on the accuracy of the underlying structure of such simulations. Acceptance of these tools hinges upon end user trust in the predicted results. As the overall implementation of a design code can be composed of a number of material models, it is essential that those models accurately reflect true physical behavior. Computations are performed using the Johnson-Holmquist (JH) constitutive model for brittle materials for penetration problems into ceramics, as implemented in both the Eulerian CTH and the Lagrangian EPIC shock physics codes. The results of the computations are compared and the influence of the numerics and material model coupling are evaluated. A description of some important computational features involving finite elements and meshless particles are also outlined, with observations on the direction of future code and model development.
DTIC

Armor; Ceramics; Models; Simulation

20080015573 ATK Launch Systems-Science and Engineering, Huntsville, AL, USA
Evaluation of the Effect of Silicone Contamination on Various Bond Systems and the Feasibility of Removing the Contamination
Stanley, Stephanie D.; February 17, 2008; 21 pp.; In English; Adhesion Society, 17-20 Feb. 2008, Austin, TX, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS8-97238; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015573

Silicone is a contaminant that can cause catastrophic failure of a bond system depending on the materials and processes

used to fabricate the bond system. Unfortunately, more and more materials are fabricated using silicone. The purpose of this testing was to evaluate which bond systems are sensitive to silicone contamination and whether or not a cleaning process could be utilized to remove the silicone to bring the bond system performance back to baseline. Due to the extensive nature of the testing, attempts will be made to generalize the understanding within classes of substrates, bond systems, and surface preparation and cleaning methods. This study was done by contaminating various metal (steel, Inconel, and aluminum), phenolic (carbon-cloth phenolic [CCP] and glass-cloth phenolic [GCP]), and rubber (natural rubber, asbestos-silicone dioxide filled natural butyldiene rubber [ASNBR]; silica-filled ethylene propylenediene monomer [SFEPDM], and carbon-filled ethylene propylenediene monomer [CFEPDM]) substrates which were then bonded using various adhesives and coatings (epoxy-based adhesives, paints, ablative compounds, and Chemlok adhesives) to determine the effect silicone contamination has on a given bond system's performance. The test configurations depended on the bond system being evaluated. The study also evaluated the feasibility of removing the silicone contamination by cleaning the contaminated substrate prior to bonding. The cleaning processes also varied depending on bond system.
Derived from text
Silicones; Adhesives; Contaminants; Bonding

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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*.

20080014508 Naval Postgraduate School, Monterey, CA USA
Characterization of Ethylene/JP-10 Fuel Injection Profiles for a Valveless Pulse Detonation Engine
Danaher, Thomas J; Dec 2007; 81 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475982; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475982

Practical use of the pulse detonation engine as a form of propulsion for future aircraft and missile platforms depends upon the ability to reliably detonate a fuel air mixture at high frequencies in order to produce an acceptable level of thrust, and to take advantage of the higher thermodynamic efficiency available from the pulse detonation engine combustion cycle. This research thesis focused on improving and mapping fuel fraction delivery profiles for a valveless pulse detonation engine. The gas dynamic conditions downstream of inlet manifold isolation chokes were evaluated for a number of geometries with Computational Fluid Dynamics software in an effort to reduce areas of recirculation in the inlet manifold of the engine and improve fuel delivery profiles. Based on the results from this modeling a new inlet manifold configuration was designed, installed and evaluated in laboratory experimentation. Laboratory testing was performed at multiple air and fuel mass flow rates using ethylene as the fuel. Absorption spectroscopy, using a He-Ne laser tuned at the 3.39 micrometer wavelength and known spectroscopic fuel absorption cross sections, was used to measure fuel mass fraction profiles for each engine inlet geometry at various flow rates. Additionally, JP10 fuel concentration profiles were determined for several fuel injector actuation pressures and at various alignments using the same diagnostic approach.
DTIC
Ethylene; Fuel Injection; Jet Engines; Pulse Detonation Engines

20080014516 Naval Postgraduate School, Monterey, CA USA
Development and Qualification of a Specialized Gas Turbine Test Stand to Research the Potential Benefits of Nanocatalyst Fuel Additives
Kraemer, Nathan A; Dec 2007; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476008; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476008

Due to the wide use of gas turbine engines, any performance improvements would yield significant impacts to many military and civilian programs. While hardware upgrades require costly replacements to existing equipment, fuel performance enhancement could provide a near term cost effective solution. This thesis research focused on the development and qualification of a suitable test stand system to provide bench testing of nanocatalyst additives for jet fuels on a full-scale tactical gas turbine engine. A Williams International F- 121 fanjet engine was acquired and set up as the centerpiece component for the desired test stand. The required auxiliary systems and sensor equipment were designed and constructed.

Initial baseline performance of the test stand and F-121 engine were demonstrated. These included the ability to determine lean ignition limits, capability to perform on-the-fly switching of fuel supply during engine operation, and capability of dynamically performing lean flame-out tests.
DTIC
Additives; Gas Turbines; Qualifications; Test Stands

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*.

20080014459 Massachusetts Inst. of Tech., Cambridge, MA USA
Femtosecond Optics: Advanced Devices and Ultrafast Phenomena
Ippen, Erich P; Fujimoto, James G; Kaertner, Franz; May 31, 2007; 48 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0011; Proj-2301/AX
Report No.(s): AD-A475859; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475859

OBJECTIVES: To investigate fundamental femtosecond-timescale phenomena in materials and devices. To evaluate the potential of these phenomena and structure for applications. To invent and demonstrate new devices for ultrafast optics. STATUS and ACCOMPLISHMENTS: Over the three years of this program we have made significant achievements in several areas: development of new femtosecond laser systems and ultrafast optical techniques; application of ultrafast optics to waveguide and fiber devices; designs and studies of novel materials and material structures. These are documented by 36 publications in refereed journals and 3 patent applications, a list of which is given at the end of this report.
DTIC
Optical Equipment; Timing Devices

20080014491 Naval Postgraduate School, Monterey, CA USA
A Study to Model Human Behavior in Discrete Event Simulation (DES) using Simkit
Tan, Boon L; Dec 1, 2007; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475946; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475946

In modern simulation systems, there are two main domains. The first is the Event Driven domain that uses events as the driver in the simulation. Event driven simulations are efficient as they avoid unnecessary time steps and, when carefully designed, can realistically represent real world events. The Time Driven paradigm, the other simulation domain, is favored by agent-based simulations due to the time stepping characteristic suitable for the agent decision cycle. Agent-based simulations such as the multi-agent systems are capable of modeling complex human intelligence and behavior. In this thesis, Discrete Event Multi Agent Simulation (DEMAS) is introduced as a new design concept which provides the mean to have the best of both simulation domains. DEMAS design concept uses event graph methodology and LEGO framework to achieve design simplicity and modularity, allowing multi-agent systems to be added into a discrete event world. To validate the new design concept, three simulations of different complexity levels were developed using Simkit Java package. The validations eventually proved the worthiness of the DEMAS design concept for providing the means to build simulations with benefiting characteristics of both multi-agent systems and discrete event simulations.
DTIC
Human Behavior; Simulation

20080015395 Naval Postgraduate School, Monterey, CA USA
Ignition Characteristics for Transient Plasma Ignition of Ethylene/air and JP-10/Air Mixtures in a Pulse Detonation Engine
Hackard, Jr, Charles N; Dec 2007; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476068; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476068

The inlet mass flow, fuel injection profile, igniter characteristics, ignition delay, and operational frequency all dictate the success of a Pulse Detonation Engine (PDE). An optical sensor was developed and utilized for the observation of ignition zone

characteristics over varying refresh conditions that showed decreasing ignition delay times when approaching marginally fuel-rich reactant mixtures. A wide range of equivalence ratios for ethylene/air mixtures were explored and a limited number of JP- 10/air mixtures. The JP-10/air fuel mixtures were nearly impossible to ignite at characteristic velocities greater than 35 m/s until a porous ignition shield was installed. The porous shield, surrounding the Transient Plasma Ignition (TPI) electrode, demonstrated the successful ignition at characteristic velocities up to 100 m/s for C2H4/air and 55 m/s for JP-10/air mixtures. The ignition shield slowed down a portion of the fuel/air mixture to increase the local residence time, allowing for more reliable ignition. The resulting combustion products proceeded to ignite the remaining fuel-air mixture. The ignition shield design appears to locally prevent a complete purge of the previous cycle s products, and a transient plasma discharge was still required for subsequent ignition to occur. This effect further reduced the observed ignition delay time in ethylene/air and JP-10/air fuel mixtures.
DTIC
Detonation; Ethylene; Fuel-Air Ratio; Ignition; Plasmas (Physics); Pulse Detonation Engines

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*.

20080014420 Naval Postgraduate School, Monterey, CA USA
Distributed Beamforming in Man Portable Communication Networks
Chan, Chun Man; Dec 2007; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475782; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475782

The advancement in communication and networking technologies lead to the emergence of network centric systems adopted by military forces. Many military forces around the world are equipping their ground soldiers with man portable or mobile wireless communication devices to form a local communication network as part of the overarching communication network for information warfare. In a non-line of sight environment, the devices communication range to the base station degrades significantly. The research objective is to examine collaborative beamforming man portable wireless communication networks in a non-ideal propagation operation environment such as in a terrain with foliage. Using distributed beamforming techniques with wireless radios, the communication range can be increased to overcome foliage attenuation and other losses. Seasonal foliage effects on the wireless network were considered in the study. Wireless beamforming strategies were devised and an analysis of system performance and tradeoffs was conducted. System synchronization of the wireless collaborative communication network is a major challenge due to the lack of fixed infrastructure and the dynamic topology of the network. Two network synchronization schemes: mutual synchronization and master-slave synchronization were investigated. Finally, an analysis of phase errors, which affect the gains achieved by distributed beamforming, was performed.
DTIC
Beamforming; Communication Networks; Portable Equipment

20080014423 Naval Postgraduate School, Monterey, CA USA
Tunneled Data Transmission over Wireless Sensor Network
Poh, Yow T; Dec 2007; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475792; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475792

A technique for terminal communication through transmission links established across a wireless sensor network is developed and tested. Using protocols established for conventional wireless communication networks as a guiding principle, different methodologies for link management, and segmentation and reassembly of information are explored. A protocol for sensor network encapsulation was designed and implemented across a network of terminals and wireless sensor motes. The study concludes with a discussion of the capabilities and limitations of this technique supported by results obtained through experiments under various scenarios.
DTIC
Communication Networks; Data Transmission; Radiotelephones

20080014445 Naval Postgraduate School, Monterey, CA USA

An Analysis of Special Operations Command - South's Distributive Command and Control Concept

Averett, Chrstian M; Cervantes, Louis A; O'Hara, Patrick M; Dec 2007; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475840; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475840

Since national, regional, or continental borders do not hinder transnational terrorist organizations, a Theater Special Operations Command is forced to conduct operations across a wide range of political and social environments. Special Operations Command-South (SOCSOUTH), the theater special operations component of the USA Southern Command, has determined that each sub-region within its area of responsibility has particular nuances that require separate and distinct command elements. Due to this determination, SOCSOUTH has decided to revise its approach to the command and control (C2) of all special operations forces operating throughout Central and South America. SOCSOUTH calls this new C2 approach 'Distributive C2'. The purpose of this thesis is to conduct a thorough analysis of the SOCSOUTH Distributive C2 concept and propose recommendations for improvement of its effectiveness and efficiency. Using multiple theories of organizational design and recommendations based on personal observations and interviews, this thesis will propose a long term command and control structure for SOCSOUTH. The authors hope to provide SOCSOUTH and other theater special operations commands with a C2 structure that will allow them to better coordinate and prosecute their war on terror mission across multiple sub-regions and ensure proper integration into a larger global counter-terrorism strategic plan.

DTIC

Command and Control; Military Personnel; South America

20080014453 Naval Postgraduate School, Monterey, CA USA

Method or Madness: Federal Oversight Structures for Critical Infrastructure Protection

Young, Charles P; Dec 2007; 75 pp.; In English

Report No.(s): AD-A475850; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475850

Telecommunications is one of our most critical national infrastructures, enabling many other infrastructure sectors to function. The federal oversight for this sector, put in place by the Department of Homeland Security, relies heavily on voluntary cooperation between the public and private sectors. Given that no large-scale disruption of the nationwide telecommunications backbone has occurred, there is no empirical evidence showing the effectiveness of the structure DHS has put in place. In an effort to gauge the effectiveness of the various existing infrastructure oversight structures, this thesis examines four specific roles assumed by the federal government and their performance in their respective sectors. These roles and sectors are Owner (aviation), Customer (power), Coordinator (local telecommunications), and Regulator (food). Each case is reviewed to determine the effects of the government role on economic impact of the disruption, the time required to restore initial operating capabilities, and the time required to restore full operating capabilities. The various cases show that the government role has little direct impact on the costs related to infrastructure disruptions. The Regulator role had a negative impact on timeliness for both initial and full restoration. The other roles all made positive contributions to both restoration timeliness.

DTIC

Communication Networks; Protection; Telecommunication

20080014460 Massachusetts Inst. of Tech., Cambridge, MA USA

Algorithms for Data Sharing, Coordination, and Communication in Dynamic Network Settings

Lynch, Nancy; Dec 3, 2007; 36 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0121

Report No.(s): AD-A475865; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475865

This project developed many distributed algorithms and corresponding lower bounds for solving important problems in dynamic networks, focusing on mobile networks with wireless communication. Problems studied include data management, time synchronization, communication problems (broadcast, geocast, and point-to-point routing), distributed consensus, tracking, and motion coordination. Highlights include (1) The discovery of a fundamental limitation in capabilities for time synchronization in large networks. (2) The identification and development of the notion of 'Virtual Node Layers' as abstraction layers for programming mobile networks; these appear to facilitate programming of key communication services, as well as motion coordination for robots, vehicles and aircraft. (3) Upper and lower bounds for solving basic problems such as

distributed consensus in mobile networks in which messages are subject to loss and collisions. (4) The development of a mathematical framework -- a combination of Timed and Probabilistic I/O Automata -- capable of modeling the dynamic networks and algorithms that were studied, and of supporting theorems about correctness and performance of the algorithms.
DTIC
Algorithms; Communication Networks; Coordination; Data Transmission; Synchronism

20080014470 Naval Postgraduate School, Monterey, CA USA
The Concurrent Implementation of Radio Frequency Identification and Unique Item Identification at Naval Surface Warfare Center, Crane, IN as a Model for a Navy Supply Chain Application
Obellos, Ernan; Colleran, Travis; Lookabill, Ryan; Dec 2007; 121 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475895; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475895

The purpose of this MBA project is to conduct an analysis of a concurrent implementation of Unique Item Identification (UID) and Radio Frequency Identification (RFID) at the Naval Surface Warfare Center at Crane, Indiana (NSWC Crane). This project will use the developments put into place at the Space and Naval Warfare Systems Command (SPAWAR) Extremely High Frequency (EHF) Satellite Communications (SATCOM) Branch in San Diego as a baseline for the implementation at NSWC Crane. This project will provide a concurrent RFID/UID implementation plan for NSWC Crane's primary warehouse facility and conduct a Knowledge Value-Added analysis of that implementation.
DTIC
Cranes; Logistics; Military Operations; Navy; Radio Frequencies; Satellite Communication; Supplying; Warfare

20080014471 Naval Postgraduate School, Monterey, CA USA
The Department of Defense's Second Chasm in RFID-UID Technology Adoption
Gray, Jonathan; Brown, Jr , Sylvester; Hood, Terrell; Dec 2007; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475896; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475896

This study examines the possibility of the existence of a Second Chasm in the DoD's Radio Frequency Identification (RFID) and Unique Identification (UID) adoption. The study focuses on the DoD's small business partner's willingness to conform to the RFID-UID mandates and their reasons why. The compliance information was collected through anonymous surveys of DoD small business suppliers. The study then discusses the results of the survey and the relevance of the data to the DoD, and concludes with our findings and recommendations for alternate implementation plans for the mandates.
DTIC
Canyons; Commerce; Radio Frequencies

20080014474 Naval Postgraduate School, Monterey, CA USA
Using Wireless Sensor Networks in Improvised Explosive Device Detection
Sundram, Joshua; Sim, Phua P; Dec 2007; 91 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475908; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475908

This research focused on wide-area surveillance of public environments for potential IEDs (improvised explosive devices) using wireless sensor networks. We explored magnetic and infrared sensors from Crossbow Technologies to detect simulated emplaced IEDs (emplacement is the step most susceptible to detection) in a public mall and along a typical street environment. The threat scenario was IED emplacement in a trash receptacle. A network of these sensors was built and positioned in these environments with human subjects entering (some carrying ferromagnetic materials and some not) and proceeding toward a receptacle. Results indicated that magnetic sensors could detect suspicious ferromagnetic materials, though not all simulated IEDs contained enough to trigger detection. Infrared sensors were not effective for such tasks as there is much background infrared radiation. Our network design was such that data could easily be aggregated over many sensors in larger networks. This suggests that the technology can be effective for protecting communal areas such as airports and urban areas. Other supplementary technologies such as imagery could be linked to build a more robust detection network.
DTIC
Communication Networks; Explosive Devices; Explosives Detection; Networks; Radiotelephones

20080014662 Army Research Lab., Aberdeen Proving Ground, MD USA

Flight Test & Recovery of Gun Launched Instrumented Projectiles Using High-G On Board Recording Techniques

Muller, Peter C; Bukowski, Edward F; Katulka, Gary L; Peregino, Philip; May 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476133; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Researchers at the Weapons and Materials Research Directorate of ARL have recently completed experimental testing with a G-hardened gun launched miniature instrumentation package that fits within the projectile fuze cavity for obtaining realistic in-bore, deceleration and projectile impact data. This device consists of an accelerometer and a digital recorder that is designed for the reliable capture of ballistic data during projectile launch, flight and target impact. During recent flight test evaluation at the ARL, APG, projectiles containing this device were tested with a telemetry link as well as recovery and direct downloading of on board recorded data. For projectile impact studies both concrete and bunker targets were successfully engaged. This methodology of on board data recording has been shown to provide a reliable and high fidelity characterization of projectile in-bore and impact events critical for advanced munitions designers.

DTIC

Ballistics; Flight Tests; Projectiles; Telemetry

20080014678 Library of Congress, Washington, DC USA

The Al-Jazeera News Network: Opportunity or Challenge for U.S. Foreign Policy in the Middle East

Sharp, Jeremy M; Jul 23, 2003; 18 pp.; In English

Report No.(s): AD-A476202; CRS-RL31889; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Al-Jazeera, the Arab world s first all-news network was started by the Persian Gulf monarchy of Qatar. It has come to be recognized as a key player in covering issues of central importance to U.S. foreign policy in the Middle East: the conflict in Iraq, the war on terrorism, and the Israeli-Palestinian conflict. Al-Jazeera has become so publicly influential that U.S. officials now regularly appear on the network. Although Al-Jazeera has received praise for its uncensored format and for airing interviews with U.S. and Israeli officials, as well as Arab critics of the policies of Arab governments, it has drawn criticism from many observers in the USA and elsewhere for a perceived lack of objectivity in covering these conflicts, including the activities of Al Qaeda. For their part, officials from Al-Jazeera have claimed that they merely reflect Arab popular resentment of U.S. policy in the Middle East. This paper provides an overview of Al-Jazeera and explores the debate surrounding its objectivity. This report also analyzes Al-Jazeera s coverage of events in the Middle East, specifically, its coverage of events in Iraq,Afghanistan, and Israel and the West Bank and Gaza Strip. The final section of this report discusses policy options regarding U.S. public diplomacy efforts in the Middle East region. This paper will be updated periodically.

DTIC

Broadcasting; Foreign Policy; International Relations; Middle East; Terrorism

20080015374 Barrios Technology, Inc., Houston, TX, USA; NASA Johnson Space Center, Houston, TX, USA

Lunar Surface Propagation Modeling and Effects on Communications

Hwu, Shian U.; Upanavage, Matthew; Sham, Catherine C.; [2008]; 7 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNJ05HI05C; Copyright; Avail.: CASI: A02, Hardcopy

This paper analyzes the lunar terrain effects on the signal propagation of the planned NASA lunar wireless communication and sensor systems. It is observed that the propagation characteristics are significantly affected by the presence of the lunar terrain. The obtained results indicate that the terrain geometry, antenna location, and lunar surface material are important factors determining the propagation characteristics of the lunar wireless communication systems. The path loss can be much more severe than the free space propagation and is greatly affected by the antenna height, operating frequency, and surface material. The analysis results from this paper are important for the lunar communication link margin analysis in determining the limits on the reliable communication range and radio frequency coverage performance at planned lunar base worksites. Key Words lunar, multipath, path loss, propagation, wireless.

Author

Wireless Communication; Lunar Communication; Lunar Surface; Lunar Effects; Communication Networks; Frequency Ranges; Lunar Bases; Radio Frequencies

20080015382 Naval Postgraduate School, Monterey, CA USA

Determining Communication Shortfalls for Homeland Defense

Wilson, Kevin P; Dec 2007; 75 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475742; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475742

Communications is a critical enabling capability that is interwoven into every facet of every military operation. Assessing what communication capability is most valuable to the operation is a vital planning process that currently resides in several processes that produce differing outcomes within the DoD. This thesis examines these planning processes, particularly the capability-based approach, assessing which process is optimum for determining communication shortfalls. An in depth comparison of the Joint Capabilities Integrated Defense System (JCIDS) and USNORTHCOM's Capability Review and Resource Assessment (CRRA) was conducted, examining the respective strengths and weakness of each process. This thesis then recommends an optimized hybrid solution of the CRRA and JCIDS, thus providing an intuitive methodology that can be used to model what communication capabilities are essential to the DoD and its interagency partners. Ultimately, this model may serve to guide the defense planning process to ensure meaningful collaboration occurs, when crafting a unified DoD and interagency position regarding communications and network-centric capability needs and shortfalls. Particular utility can be applied to fill the gap of interoperable communications solutions between first responders, the military, interagency and Coalition partners, when teaming in a homeland defense scenario.

DTIC

Communication Networks; Transponders

20080015414 Defense Science Board, Washington, DC USA

Report of the Defense Science Board Task Force on Strategic Communication

Jan 2008; 159 pp.; In English

Report No.(s): AD-A476331; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The 2007 Defense Science Board (DSB) Task Force on Strategic Communication has written this report within the context of a larger study, the DSB 2007 Summer Study on Challenges to Military Operations in Support of National Interests. The summer study recognized that effective strategic communication, coordinated and executed in association with all aspects of national capacity, can help to prevent and limit conflicts and greatly enhance responses to global challenges that threaten America's interests and values. In this context, the objectives of the 2007 DSB Task Force on Strategic Communication were to: (1) Review and assess the recommendations made in the 2004 DSB report on Strategic Communication and the 2001 DSB report on Managed Information Dissemination. (2) Review and assess strategic communication activities since 2004. (3) Establish actionable recommendations for strategic communication in the 21st century.

DTIC

Information Dissemination; Military Operations

20080015487 Air Univ., Maxwell AFB, AL USA

Communications and Integration Enhancements to Improve Homeland Security

Sando, Terrance W; Jul 2007; 40 pp.; In English

Report No.(s): AD-A475816; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475816

This paper addresses specific and streamlined situational awareness recommendations that, when combined with National Guard capabilities, will greatly enhance U.S. Homeland Security responses. These technology enhancements and processes combined with the force capabilities that the National Guard has recently created, when integrated with other national capabilities, will greatly improve national coordination during responses to national disasters or potential terrorist attacks. These capabilities are especially critical in responding to potential mega-terror events for which the nation needs to prepare. Because of the sense of urgency generated from the attacks of September 11, 2001, a large amount of money has been spent to prepare the country for future terrorist attacks. Unfortunately, there has been too little attention given to ensure that the resulting system-of-systems is seamlessly tied together. The Department of Defense is one of many federal agencies and organizations responsible for Homeland Security. The military, being the lead for Homeland Defense, is supported by other agencies in defending against external threats and aggression. However, in most instances, the collaboration capabilities were specifically designed for military operations not Homeland Security. In a tight budgetary environment, utilizing all the nation's capabilities in the optimal way must be a top priority. The National Guard provides a cost-effective and responsive force that can utilize not only its manpower and resources, but also its positioning in local communities where it has been performing Homeland Security and Defense for over 300 years. Building on this foundation is a force structure trained to respond to

catastrophic events. The problem addressed here is how the nation can capitalize on the National Guard's evolving capabilities to help bring the nation's other agencies seamlessly into responses to natural disasters or terrorist attacks.
DTIC
Armed Forces (United States); Augmentation; Communication Networks; Coordination; Responses; Security; Situational Awareness

20080015512 National Inst. of Aerospace Associates, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA
Estimating Random Errors Due to Shot Noise in Backscatter Lidar Observations
Liu, Zhaoyan; Hunt, William; Vaughan, Mark A.; Hostetler, Chris A.; McGill, Matthew J.; Powell, Kathy; Winker, David M.; Hu, Yongxiang; [2006]; 26 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In this paper, we discuss the estimation of random errors due to shot noise in backscatter lidar observations that use either photomultiplier tube (PMT) or avalanche photodiode (APD) detectors. The statistical characteristics of photodetection are reviewed, and photon count distributions of solar background signals and laser backscatter signals are examined using airborne lidar observations at 532 nm using a photon-counting mode APD. Both distributions appear to be Poisson, indicating that the arrival at the photodetector of photons for these signals is a Poisson stochastic process. For Poisson-distributed signals, a proportional, one-to-one relationship is known to exist between the mean of a distribution and its variance. Although the multiplied photocurrent no longer follows a strict Poisson distribution in analog-mode APD and PMT detectors, the proportionality still exists between the mean and the variance of the multiplied photocurrent. We make use of this relationship by introducing the noise scale factor (NSF), which quantifies the constant of proportionality that exists between the root-mean-square of the random noise in a measurement and the square root of the mean signal. Using the NSF to estimate random errors in lidar measurements due to shot noise provides a significant advantage over the conventional error estimation techniques, in that with the NSF uncertainties can be reliably calculated from/for a single data sample. Methods for evaluating the NSF are presented. Algorithms to compute the NSF are developed for the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) lidar and tested using data from the Lidar In-space Technology Experiment (LITE). OCIS Codes:
Author
Random Errors; Shot Noise; Backscattering; Error Analysis; Noise Measurement; Optical Radar; Poisson Density Functions; Photomultiplier Tubes; Radar Measurement

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*.

20080014266 NASA Langley Research Center, Hampton, VA, USA
Recent Development of Sb-based Phototransistors in the 0.9- to 2.2-microns Wavelength Range for Applications to Laser Remote Sensing
Abedin, M. Nurul; Refaat, Tamer F.; Sulima, Oleg V.; Singh, Upendra N.; International Journal of High Speed Electronics and Systems; [2006]; Volume 16, No. 2, pp. 567-582; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-258-80-46; Copyright; Avail.: CASI: A03, Hardcopy

We have investigated commercially available photodiodes and also recent developed Sb-based phototransistors in order to compare their performances for applications to laser remote sensing. A custom-designed phototransistor in the 0.9- to 2.2-microns wavelength range has been developed at AstroPower and characterized at NASA Langley's Detector Characterization Laboratory. The phototransistor's performance greatly exceeds the previously reported results at this wavelength range in the literature. The detector testing included spectral response, dark current and noise measurements. Spectral response measurements were carried out to determine the responsivity at 2-microns wavelength at different bias voltages with fixed temperature; and different temperatures with fixed bias voltage. Current versus voltage characteristics were also recorded at different temperatures. Results show high responsivity of 2650 A/W corresponding to an internal gain of three orders of magnitude, and high detectivity (D*) of 3.9x10(exp 11) cm.Hz(exp 1/2)/W that is equivalent to a noise-equivalent-power of 4.6x10(exp -14) W/Hz(exp 1/2) (-4.0 V \@ -20 C) with a light collecting area diameter of 200-microns. It appears

that this recently developed 2-micron phototransistor's performances such as responsivity, detectivity, and gain are improved significantly as compared to the previously published APD and SAM APD using similar materials. These detectors are considered as phototransistors based-on their structures and performance characteristics and may have great potential for high sensitivity differential absorption lidar (DIAL) measurements of carbon dioxide and water vapor at 2.05-microns and 1.9-microns, respectively.
Author
Antimonides; Phototransistors; Lasers; Remote Sensing; Photodiodes

20080014287 NASA Langley Research Center, Hampton, VA, USA
The Dual Wavelength UV Transmitter Development for Space Based Ozone DIAL Measurements
Prasad, Narasimha S.; [2008]; 27 pp.; In English; Laser Risk Reduction Program Technical Interchange Meeting, 29-30 Aug. 2006, Hampton, VA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 478643.02.02.02.02; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014287

The objective of this research is to develop efficient 1-micron to UV wavelength conversion technology to generate tunable, single mode, pulsed UV wavelengths of 320 nm and 308 nm. The 532 nm wavelength radiation is generated by a 1064 nm Nd:YAG laser through second harmonic generation. The 532 nm pumps an optical parametric oscillator (OPO) to generate 803 nm. The 320 nm is generated by sum frequency generation (SFG) of 532 nm and 803 nm wavelengths The hardware consists of a conductively cooled, 1 J/pulse, single mode Nd:YAG pump laser coupled to an efficient RISTRA OPO and SFG assembly-Both intra and extra-cavity approaches are examined for efficiency.
Derived from text
Ozone; Transmitters; Ultraviolet Radiation; Differential Absorption Lidar; Wavelengths

20080014389 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Hull, Mechanical, and Electrical Equipment Standardization in the U.S. Navy Surface Force: A Case of Competing Objectives and Stakeholder Trade-Off Decisions
White, Jerome R; Dec 14, 2007; 156 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475657; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475657

The lack of a successful Standardization Program for Hull, Mechanical, and Electrical (HM&E) equipment and components of ships in the surface force costs the USA Navy hundreds of millions of dollars annually. Approximately half of the total parts in the surface fleet are installed on three or fewer ships and nearly 20 percent are one of a kind. These parts are not officially considered to be 'non-standard' since they have been approved by the Navy and entered into the National Stock Number system. However, variations in equipment brands, models, as well as technical and physical characteristics result in significant issues for the Navy each year. The root cause of this real lack of equipment standardization is the existence of competing objectives and priorities on the part of stakeholders in the equipment selection process. These competing objectives lead to stakeholder trade-off decisions that effectively reduce equipment standardization throughout the Navy Surface Force. This is a result of decisions that are made in the best interest of the stakeholder instead of for the good of HM&E equipment standardization and moreover for the greater good of fleet operational readiness. This research presents an analysis of the people, organizations, and activities that influence HM&E equipment standardization to determine the extent of their impact and the reasons for their equipment selection decisions. The analysis reveals that competing objectives exist at the National Strategic Level, at the DoD Strategic Level, and at both the Operational and Tactical Levels in the Navy. Finally, potential options are identified that the Navy could pursue to minimize the impact of competing objectives and stakeholder trade-off decisions on the HM&E equipment standardization process. With the explosion of new technology and the increased availability of high-performance
DTIC
Electric Equipment; Hulls (Structures); Mechanical Properties; Military Operations; Navy; Standardization; Tradeoffs

20080014504 Naval Postgraduate School, Monterey, CA USA
Comparison of Gallium Nitride High Electron Mobility Transistors Modeling in Two and Three Dimensions
Gibson, William A; Dec 2007; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475972; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475972

This thesis looks at modeling Gallium Nitride (GaN) High Electron Mobility Transistor (HEMT) Semiconductors. The

GaN device has potential future military use in the high power and high frequency operation replacing costly millimeter wave tubes This would affect military radar systems, electronic surveillance systems, communications systems and high voltage power systems by providing smaller and more reliable devices to drive operation This thesis looks at using diamond substrate to improve the then%al management of a HEMT device over that of a sapphire substrate The improved then%al management should lead to improved operating characteristics and reliability The HEMT device was modeled using Silvaco software package and compared to an actual device on sapphire substrate The results of the software model showed the improved thermal characteristics of the HEMT device on the diamond substrate over that of the sapphire.
DTIC
Gallium Nitrides; High Electron Mobility Transistors; Semiconductors (Materials)

20080014505 Naval Postgraduate School, Monterey, CA USA
Digital Tracking Array for FM Signals Based on Off-The-Shelf Wireless Technologies
Edmund, Hui K; Dec 2007; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475975; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475975

The purpose of this research is to design a digital phased array for receiving and tracking a 2.4 GHz frequency modulation (FM) video signal from an unmanned air vehicle. The tracking is done using a monopulse technique Various numbers of elements were simulated to access the pattern coverage. The beamforming and demodulation are performed digitally by a computer. Several antenna architectures were studied and the requirements for hardware components such as the analog-to-digital converters and amplifiers are specified. Several methods for generating the carrier signal for the local oscillator are also discussed. They include an independent local oscillator, a voltage controlled oscillator with feedback (i.e., a phased locked loop) and mixing with a phase shifted copy of the received signal (Bilotti's method).
DTIC
Digital Systems; Frequency Modulation; Phased Arrays

20080014513 Naval Postgraduate School, Monterey, CA USA
Transport Imaging for the Study of Nanowires and Related Nanostructures
Hwee, Ang G; Dec 2007; 105 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475996; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475996

The goals of this thesis are to demonstrate the operation of a near-field scanning microscope (NSOM) inside a scanning electron microscope (SEM) to collect spatially resolved luminescence and to image transport on nano-scale structures particularly nanowires. The SEM is used to generate localized charge and the NSOM is used to observe the motion of the excess charge due to diffusion and/or drift via its recombination emission. This will allow direct determination of transport parameters such as minority carrier mobility and lifetime that are key to the performance of LEDs lasers and bipolar devices. For nano-structures such as nanowires device sizes are commonly less than 100 nm. The resolution in a standard optical microscope is diffraction limited and hence resolution of luminescence from individual devices requires collection of light in the near field limit. An atomic force microscope (AFMlNSOM) has been installed in the SEM to allow for simultaneous near field optical collection with an electron beam for charge generation. The work in this thesis has observed CL luminescence from ZnO nanowires using normal SEM-OM and anaylzed the spectra. In addition the work has demonstrated successful AFMINSOM operation within the SEM. Light is collected from both GaAs heterostructures and single ZnO nanowires and control experiments have been performed. Challenges for transport imaging in SEM have been identified Finally a suggestion for further work is to specifically image charge motion along a single wire including electric field mapping in these nanoscale low dimensional structures. These nanoscale wires are poised to revolutionize solid state devices in the near future and direct measurements of key electronic parameters will be required.
DTIC
Electron Microscopes; Imaging Techniques; Nanostructures (Devices); Nanotechnology; Nanowires

20080014522 Florida Univ., Gainesville, FL USA
Addressable Immobilized Ion Channels: Optimization of Ion Channels Tethered to Device Surfaces
Duran, Randy; Jul 25, 2007; 6 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0393
Report No.(s): AD-A476025; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476025

This work is performed by a team at Florida, Mainz, Texas, Agave Biosystems and Miami. We are attempting to develop

a sensitive and selective biomolecular detection system based on arrays ion channel covalently tethered over microelectronic devices. The technical approach involves inserting ion channels in non-native membrane bilayers, characterizing and optimizing the single channel stochastic response, and tethering these assemblies over device gate surfaces. Enhancing the stability of the assemblies is another important part of the program. The sensing will be based on this device architectures whereby the placement of individual analyte molecules at the throat of the ion channel will in turn change the stochastic signature associated with the ion translocation measured by the device. Optimizing and tethering the channels, enhancing stability, and demonstrating chem/bio agent signatures as well as interferants. There have been a number several recent accomplishments in this program. We have obtained gigaohm seals and formed these seals on gold micro electrodes with >80% pixel-to-pixel seal formation. We have measured single channel activity from more than ten different ion channel systems including three genetic variants of Maxi-K, Uranacidin A, and a mechanosensitive channel. We obtained on-device pharmacological response from micromolar organophosphate and could wash it off the device. We assembled S-layer proteins at the lipid bilayer interface, enhancing stability. We studied bilayer formation by QCN-d.
DTIC
Ions; Tethering

20080014523 Naval Postgraduate School, Monterey, CA USA
Operating Standby Redundant Controller to Improve Voltage Source Inverter Reliability
Blevins, Stephen T; Dec 2007; 147 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476028; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476028

This thesis presents a control architecture that achieves operating standby redundancy for a voltage source inverter controller. The system was designed to increase reliability by switching from the primary to the secondary controller when a fault to the primary controller occurs. The behavior of the system was predicted using a computer model representing the redundant controller architecture. The simulated results were then verified in lab hardware comprising two FPGAs, a three phase rectifier, an LC filter, and a resistive load. Both simulated and experimental results validate that the final redundant controller design switches between redundant controllers with a negligible disturbance.
DTIC
Controllers; Electric Potential; Inverters; Redundancy; Reliability

20080014542 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Structural Waveguides for Aerodynamic Turbulent Drag Reduction
Vlachos, Pavlos P; Johnson, Martin; Toso, Alessandro; Carneal, James; Dec 30, 2007; 27 pp.; In English
Contract(s)/Grant(s): FA9550-07-1-0064
Report No.(s): AD-A476056; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476056

The objective of this project was to provide a proof-of-concept that travelling wave disturbances on the surface of a vehicle can generate viscous drag reduction benefits. This would be accomplished by developing structural waveguides within a cylinder that under actuation impart a structural surface wave disturbance in the form of a travelling wave. During the nine month performance of the work presented herein we were successful indesigning and fabricating structural waveguides. Structural characterization of the prototype demonstrates that the performance met the design expectation. Subsequently, initial aerodynamic testing was performed in order to validate that the proposed concept can impart flow disturbances that reduce turbulent viscous drag. At the time of this report only quantitative flow visualization under quiescent flow conditions had been performed and preliminary analysis of the results is presented. The PIV results showed a three stage cycle occurring, which creates a motion that sweeps the flow very close to the wall in a clockwise direction. This movement of fluid might interrupt the near-wall turbulence production.
DTIC
Aerodynamic Drag; Drag Reduction; Turbulent Flow; Waveguides

20080014553 Washington Univ., Seattle, WA USA
Bio-Inspired Organic/Inorganic Hybrid Electronic and Photonic Materials and Structures
Jen, Alex K-Y; Sarikaya, Mehmet; Ginger, David; Dec 31, 2007; 10 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0063
Report No.(s): AD-A476092; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476092

The goal of this project was to use DNA and protein as templates to assemble nanoparticles and functional molecules for

photonic and electronic applications such as plasmon-enhanced fluorescence and surface-enhanced Raman scattering (SERS) (Fig. 1). Towards this goal, we have utilized both genetic and materials engineering tools. We have followed the molecular biomimetic approach in the assembly of nanoparticles. We have developed protocols using involving biological attachment of nanoparticles and quantum dots onto engineered surface-binding polypeptides (GEPI), and have used directed assembly of nanoparticles and/or functional molecular units.
DTIC
Biomimetics; Genetic Engineering; Molecular Electronics; Nanoparticles; Nanotechnology; Peptides; Photonics; Polypeptides; Quantum Dots

20080014667 Naval Research Lab., Washington, DC USA
Pulsed Current Static Electrical Contact Experiment
Jones, Harry N; Neri, Jesse M; Boyer, Craig N; Cooper, Khershed P; Meger, Robert A; May 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476156; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Railguns involve both static and sliding electrical contacts, which must transmit the large transient electrical currents necessary to impart high forces onto a projectile for acceleration to hypervelocity. Static electrical contacts between metals initially take place through small asperities, or 'a-spots', distributed over the contact area. The voltage developed across the interface is directly related to the contact temperature and pressure, the number of a-spots, the thermophysical and mechanical properties of the contacting materials, the current history, and any interfacial materials that may be present. To physically simulate some of the conditions attained within a railgun, a pulsed current static electrical contact experimental facility has been developed at the Naval Research Laboratory. This facility employs a 500 kN capacity servohydraulic load frame equipped with an electrically insulated load train to establish a contact pressure on interfaces between metals through which a pulsed current is transmitted. The time dependent evolutions of the voltage drops across the interfaces, as detected by probes pushed into the contacting materials, are recorded during a 40 kA peak current pulse having a 300 microsecs time with peak current densities on the order of 50 kA/cm2. The interface stack is assembled from a 12 mm outside diameter annular disk of metal with a 6.3 mm hole which is compressed between two hollow pedestals of a second metal. The evolution of the voltage drop across an interface during a pulse will be described as a function of initial contact pressures, current density, and polarity for dissimilar (Al/Cu) metal contacts. Thermal effects on the surfaces, including localized melting of the interface materials, were also investigated.
DTIC
Electric Contacts; Thermodynamic Properties

20080014672 Texas Univ., Austin, TX USA
Coefficient of Friction Measurement in the Presence of High Current Density
Brown, L; Xu, D; Ravi-Chandar, K; Satapathy, S; May 2006; 9 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0599; N00178-05-WR-00297
Report No.(s): AD-A476178; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On the micro-scale, armature rail interface contact is accomplished through surface asperity interaction. In this imperfect contact model (a version of the Bowden-Tabor model), we postulate the coexistence of one or more contact regimes, such as solid solid contact, liquid metal lubricated contact, and arcing contact. We are developing microscopic models and experimental apparatus to study this postulate. This work in particular describes the experimental apparatus developed to assist in the investigation of possible contact regimes and presents preliminary data that indicate a possible decrease in coefficient of friction in the presence of high current density when compared to a no-current condition.
DTIC
Coefficient of Friction; Coefficients; Current Density; Friction; Friction Measurement; High Current; Measurement

20080014690 Air Command and Staff Coll., Maxwell AFB, AL USA
Electromagnetic Pulse Threats to U.S. Expeditionary Operations in 2010
Miller, Colin R; Apr 2005; 40 pp.; In English
Report No.(s): AD-A476271; AU/SCHOOL/40-2712/2004-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

U.S. military forces depend on electronic systems and information dominance to produce overwhelming combat power. Indeed, defense leaders are calling for the development of a network-centric force to rapidly deploy and conduct decisive

operations in the future security environment. Unfortunately, the information revolution embraced by the military has a dark side -- it introduces a potentially catastrophic vulnerability. Electronics, the foundation of the network-centric force, are extremely vulnerable to a rapidly proliferating class of arms: electromagnetic pulse (EMP) weapons. EMP weapons come in many forms and levels of sophistication. Some EMP weapons can be built from readily available parts for a few hundred dollars, some require extensive technological expertise and research facilities, but the most effective EMP weapons require both the capability to build a nuclear device and the ability to launch it with a missile. While recent literature has proclaimed that the sky is falling with regard to U.S. vulnerability to EMP, the truth is that not all EMP weapons produce catastrophic effects on all systems. The goal of this paper is to classify near-term EMP threats to U.S. expeditionary operations in terms of their probability of use, lethal range, the systems they affect, and their potential users to identify high-payoff protective measures. In conclusion, the author presents cost-effective solutions to address the most likely and most dangerous threats. DTIC

Electromagnetic Pulses; Electronic Equipment; Protection; Threat Evaluation

20080014698 Maryland Univ., College Park, MD USA

Utilities Privatization in the USA Air Force

Scott, David R; Jan 2007; 161 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476311; CIO8-0002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DOD) has roughly 2,600 electric, water, wastewater, and natural gas utility systems valued at an estimated $50 billion. In 1997, DOD decided that privatization was the preferred method for attaining industry standards for utility systems. The Air Force has ownership of 502 of these utility systems. This thesis will provide a background of DOD policy, the Air Force s Utilities Privatization Program and Guidance, findings made by the Government Accountability Office (GAO) and actions taken to remedy those findings, and discuss several issues that personnel involved in utilities privatization should understand and remain vigilant of during the privatization process and throughout the life of the contracts. DTIC

Costs; Electrical Properties; Industries; Natural Gas; United States; Utilities; Waste Water

20080014713 Maryland Univ., College Park, MD USA

Multiprocessor Clustering for Embedded System Implementation

Kianzad, Vida; Bhattacharyya, Shuvra S; Jun 2001; 11 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0023; 9734275

Report No.(s): AD-A476332; UMIACS-TR-2001-52; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we address two key trends in the synthesis of implementations for embedded multiprocessors - (1) the increasing importance of managing interprocessor communication (IPC) in an efficient manner, and (2) the acceptance of significantly longer compilation time by embedded system designers. The former aspect is especially evident in the increasing interest among embedded system architects in innovative communication architectures, such as those involving optical interconnection technologies, and hybrid electro-optical structures. The latter aspect - increased compile-time tolerance - results because embedded multiprocessor systems are typically designed as final implementations for dedicated functions. While multiprocessor mapping strategies for general-purpose systems are usually designed with low to moderate complexity as a constraint, embedded system design tools are allowed to employ more thorough and time-consuming optimization techniques. DTIC

Embedding; Multiprocessing (Computers)

20080014721 New Orleans Univ., LA USA

Spintronic Nanodevices Defines by Nanolithography

O'Connor, Charles J; Dec 15, 2007; 15 pp.; In English

Contract(s)/Grant(s): HR0011-04-1-0029

Report No.(s): AD-A476365; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this report is to document the results of the complete effort for this project, which was to explore the possibilities of employing nanoparticles, nanostructured thin films, and nanowires in spintronic nanodevice fabrication by using e-beam lithography techniques at AMRl-UNO. DTIC

Lithography; Nanofabrication; Nanostructures (Devices); Nanotechnology; Semiconductors (Materials); Vapor Deposition

20080014792 Department of the Navy, Washington, DC USA

A Method for Coupling a Direct Current Power Source Across a Dielectric Membrane or Other Non-Conducting Membrane

Steinbrecher, Donald H, Inventor; Jan 30, 2008; 42 pp.; In English

Report No.(s): AD-D020318; No Copyright; Avail.: Other Sources

A method for coupling power across a non-conducting membrane. A generator converts a DC source on a first side of a non-conducting membrane to a square-wave at a determined frequency. The generator output connects to a transformer and onto a first set of capacitor plates on the first side of the membrane. A second set of plates on the second side of the membrane form a set of coupling capacitors wherein the non-conducting dielectric membrane becomes part of the coupling-capacitor dielectric material. The second set of plates connects to a transformer and onto a non-linear circuit that converts the square-wave to DC voltage and current that can power a load such that the power delivered is approximately equal to the power available from the DC source on the first side of the membrane. The coupling capacitors may be replaced by coupled coils with nearly the same power delivery effect.

DTIC

Dielectric Properties; Dielectrics; Direct Current; Membranes

20080014793 Department of the Navy, Washington, DC USA

A Method for Coupling a Direct Current Power Source Across a Nearly Frictionless High-Speed Rotation Boundary

Steinbrecher, Donald H, Inventor; Jan 30, 2008; 42 pp.; In English

Report No.(s): AD-D020319; No Copyright; Avail.: Other Sources

A system and method is provided for coupling a power source across a rotation boundary. A generator converts a DC source on the stationary side of a rotation boundary to a square-wave at a determined frequency. The generator output connects through a transmission line and a first transformer to a set of stator rings. A set of rotor rings form a set of coupling capacitors with the stator rings. The rotor rings connect through a second transformer and a transmission line to a non-linear circuit capable of converting the square-wave to a DC voltage and current that can power a load on the rotating side of the rotating boundary in which the power is nearly equal to the power available from the source on the stationary side of the rotation boundary.

DTIC

Boundaries; Direct Current; High Speed; Rotation

20080014858 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

SiC vs. Si for High Radiation Environments: NASA Electronic Parts and Packaging (NEPP) Program Office of Safety and Mission Assurance

Harris, Richard D.; January 15, 2008; 23 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 939904.01.11.30; JPL Proj. 102198

Report No.(s): JPL-Publ-08-06; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40729

Commercial silicon carbide and silicon Schottky barrier power diodes have been subjected to 203 MeV proton irradiation and the effects of the resultant displacement damage on the I-V characteristics have been observed. Changes in forward bias I-V characteristics are reported for fluences up to 4 x 10(exp 14) p/cm2. For devices of both material types, the series resistance is observed to increase as the fluence increases. The changes in series resistance result from changes in the free carrier concentration due to carrier removal by the defects produced. A simple model is presented that allows calculation of the series resistance of the device and then relates the carrier removal rate to the changes in series resistance. Using this model to calculate the carrier removal rate in both materials reveals that the carrier removal rate in silicon is less than that in silicon carbide, indicating that silicon is the more radiation tolerant material.

Author

Silicon; Silicon Carbides; Electronic Packaging; Schottky Diodes; Carrier Density (Solid State); Fluence

20080015447 Delaware Univ., Newark, DE, USA

2.4 Micrometer Cutoff Wavelength AlGaAsSb/InGaAsSb Phototransistors

Sulima, O. V.; Swaminathan, K.; Refaat, T. F.; Faleev, N. N.; Semenov, A. N.; Solov'ev, V. A.; Ivanov, S. V.; Abedin, M. N.; Singh, U. N.; Prather, D.; January 2006; 10 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS1-02117; NNL04AC40T; Copyright; Avail.: CASI: A02, Hardcopy

We report the first AlGaAsSb/InGaAsSb phototransistors with a cutoff wavelength (50% of peak responsivity) of 2.4

micrometers operating in a broad range of temperatures. These devices are also the first AlGaAsSb/InGaAsSb heterojunction phototransistors (HPT) grown by molecular beam epitaxy (MBE). This work is a continuation of a preceding study, which was carried out using LPE (liquid phase epitaxy)-grown AlGaAsSb/InGaAsSb/GaSb heterostructures. Although the LPE-related work resulted in the fabrication of an HPT with excellent parameters [1-4], the room temperature cutoff wavelength of these devices (approximately 2.15 micrometers) was determined by fundamental limitations implied by the close-to-equilibrium growth from Al-In-Ga-As-Sb melts. As the MBE technique is free from the above limitations, AlGaAsSb/InGaAsSb/GaSb heterostructures for HPT with a narrower bandgap of the InGaAsSb base and collector - and hence sensitivity at longer wavelengths (lambda) - were grown in this work. Moreover, MBE - compared to LPE - provides better control over doping levels, composition and width of the AlGaAsSb and InGaAsSb layers, compositional and doping profiles, especially with regard to abrupt heterojunctions. The new MBE-grown HPT exhibited both high responsivity R (up to 2334 A/W for lambda=2.05 micrometers at -20 deg C.) and specific detectivity D* (up to 2.1 x 10(exp 11) cmHz(exp 1/2)/W for lambda=2.05 micrometers at -20 deg C).
Author
Alloys; Phototransistors; Heterojunction Devices; Wavelengths; Room Temperature; Spectral Sensitivity

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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*.

20080014254 NASA Langley Research Center, Hampton, VA, USA
Simulation of Synthetic Jets in Quiescent Air Using Unsteady Reynolds Averaged Navier-Stokes Equations
Vatsa, Veer N.; Turkel, Eli; AIAA Journal; [2006]; Volume 44, No. 2, pp. 217-224; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-762-45-MC; Copyright; Avail.: CASI: A03, Hardcopy

We apply an unsteady Reynolds-averaged Navier-Stokes (URANS) solver for the simulation of a synthetic jet created by a single diaphragm piezoelectric actuator in quiescent air. This configuration was designated as Case 1 for the CFDVAL2004 workshop held at Williamsburg, Virginia, in March 2004. Time-averaged and instantaneous data for this case were obtained at NASA Langley Research Center, using multiple measurement techniques. Computational results for this case using one-equation Spalart-Allmaras and two-equation Menter's turbulence models are presented along with the experimental data. The effect of grid refinement, preconditioning and time-step variation are also examined in this paper.
Author
Navier-Stokes Equation; Reynolds Averaging; Unsteady Flow; Computational Fluid Dynamics; Computerized Simulation; Jet Flow

20080014263 NASA Langley Research Center, Hampton, VA, USA
Finite Volume Numerical Methods for Aeroheating Rate Calculations from Infrared Thermographic Data
Daryabeigi, Kamran; Berry, Scott A.; Horvath, Thomas J.; Nowak, Robert J.; Journal of Spacecraft and Rockets; [2006]; Volume 43, No. 1, pp. 54-62; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-745-30-30; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014263

The use of multi-dimensional finite volume heat conduction techniques for calculating aeroheating rates from measured global surface temperatures on hypersonic wind tunnel models was investigated. Both direct and inverse finite volume techniques were investigated and compared with the standard one-dimensional semi-infinite technique. Global transient surface temperatures were measured using an infrared thermographic technique on a 0.333-scale model of the Hyper-X forebody in the NASA Langley Research Center 20-Inch Mach 6 Air tunnel. In these tests the effectiveness of vortices generated via gas injection for initiating hypersonic transition on the Hyper-X forebody was investigated. An array of streamwise-orientated heating striations was generated and visualized downstream of the gas injection sites. In regions without significant spatial temperature gradients, one-dimensional techniques provided accurate aeroheating rates. In regions with sharp temperature gradients caused by striation patterns multi-dimensional heat transfer techniques were necessary to obtain more accurate heating rates. The use of the one-dimensional technique resulted in differences of 20% in the calculated heating

rates compared to 2-D analysis because it did not account for lateral heat conduction in the model.
Author
Finite Volume Method; Aerodynamic Heating; Thermography; Conductive Heat Transfer; Surface Temperature; Hypersonic Wind Tunnels; Temperature Gradients; Computational Fluid Dynamics

20080014271 NASA Langley Research Center, Hampton, VA, USA
Rapid Structured Volume Grid Smoothing and Adaption Technique
Alter, Stephen J.; Journal of Aerospace Computing, Information, and Communication; [2006]; Volume 3, No. 1, pp. 5-20; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-376-70-30-08; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014271

A rapid, structured volume grid smoothing and adaption technique, based on signal processing methods, was developed and applied to the Shuttle Orbiter at hypervelocity flight conditions in support of the Columbia Accident Investigation. Because of the fast pace of the investigation, computational aerothermodynamicists, applying hypersonic viscous flow solving computational fluid dynamic (CFD) codes, refined and enhanced a grid for an undamaged baseline vehicle to assess a variety of damage scenarios. Of the many methods available to modify a structured grid, most are time-consuming and require significant user interaction. By casting the grid data into different coordinate systems, specifically two computational coordinates with arclength as the third coordinate, signal processing methods are used for filtering the data [Taubin, CG v/29 1995]. Using a reverse transformation, the processed data are used to smooth the Cartesian coordinates of the structured grids. By coupling the signal processing method with existing grid operations within the Volume Grid Manipulator tool, problems related to grid smoothing are solved efficiently and with minimal user interaction. Examples of these smoothing operations are illustrated for reductions in grid stretching and volume grid adaptation. In each of these examples, other techniques existed at the time of the Columbia accident, but the incorporation of signal processing techniques reduced the time to perform the corrections by nearly 60%. This reduction in time to perform the corrections therefore enabled the assessment of approximately twice the number of damage scenarios than previously possible during the allocated investigation time.
Author
Computational Fluid Dynamics; Hypersonic Flight; Signal Processing; Space Shuttle Orbiters; Data Smoothing; Structured Grids (Mathematics)

20080014274 NASA Langley Research Center, Hampton, VA, USA
Summary of the 2004 CFD Validation Workshop on Synthetic Jets and Turbulent Separation Control
Rumsey, C. L.; Gatski, T. B.; Sellers, W. L., III; Vatsa, V. N.; Viken, S. A.; AIAA Journal; [2006]; Volume 44, No. 2, pp. 197-207; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-762-45-MF; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014274

A computational fluid dynamics (CFD) validation workshop for synthetic jets and turbulent separation control (CFDVAL2004) was held in Williamsburg, Virginia in March 2004. Three cases were investigated: synthetic jet into quiescent air, synthetic jet into a turbulent boundary layer crossflow, and flow over a hump model with no-flow-control, steady suction, and oscillatory control. This paper is a summary of the CFD results from the workshop. Although some detailed results are shown, mostly a broad viewpoint is taken, and the CFD state-of-the-art for predicting these types of flows is evaluated from a general point of view. Overall, for synthetic jets, CFD can only qualitatively predict the flow physics, but there is some uncertainty regarding how to best model the unsteady boundary conditions from the experiment consistently. As a result, there is wide variation among CFD results. For the hump flow, CFD as a whole is capable of predicting many of the particulars of this flow provided that tunnel blockage is accounted for, but the length of the separated region compared to experimental results is consistently overpredicted.
Author (revised)
Computational Fluid Dynamics; Jet Flow; Separated Flow; Turbulent Boundary Layer; Unsteady Flow; Boundary Layer Flow

20080014285 NASA Langley Research Center, Hampton, VA, USA
Heat-Pipe-Cooled Leading Edges for Hypersonic Vehicles
Glass, David E.; July 12, 2006; 37 pp.; In English; Workshop on Materials and Structures for Hypersonic Flight, 12-13 Jul. 2006, Santa Barbara, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 685771.01.049SY0.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014285

Heat pipes can be used to effectively cool wing leading edges of hypersonic vehicles. . Heat-pipe leading edge development. Design validation heat pipe testing confirmed design. Three heat pipes embedded and tested in C/C. Single J-tube heat pipe fabricated and testing initiated. HPCLE work is currently underway at several locations.
Derived from text
Heat Pipes; Leading Edges; Liquid Cooling; Hypersonic Vehicles; Wings

20080014291 NASA Langley Research Center, Hampton, VA, USA
CFD: A Castle in the Sand?
Kleb, William L.; Wood, William A.; Journal of Aerospace Computing, Information, and Communication; January 2004; Volume 3, No. 6, pp. 244-250; In English; 34th AIAA Fluid Dynamics Conference, 28 Jun. - 1 Jul. 2004, Portland, OR, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 23-617-43-01-10
Report No.(s): AIAA Paper 2004-2627; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014291

The computational simulation community is not routinely publishing independently verifiable tests to accompany new models or algorithms. A survey reveals that only 22% of new models published are accompanied by tests suitable for independently verifying the new model. As the community develops larger codes with increased functionality, and hence increased complexity in terms of the number of building block components and their interactions, it becomes prohibitively expensive for each development group to derive the appropriate tests for each component. Therefore, the computational simulation community is building its collective castle on a very shaky foundation of components with unpublished and unrepeatable verification tests. The computational simulation community needs to begin publishing component level verification tests before the tide of complexity undermines its foundation.
Author
Computational Fluid Dynamics; Algorithms; Computerized Simulation; Numerical Analysis

20080014300 NASA Langley Research Center, Hampton, VA, USA
Some Observations on Grid Convergence
Salas, manuel D.; Computers and Fluids; [2006]; Volume 37, No. 7, pp. 688-692; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-065-10-M2; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014300

It is claimed that current practices in grid convergence studies, particularly in the field of external aerodynamics, are flawed. The necessary conditions to properly establish grid convergence are presented. A theoretical model and a numerical example are used to demonstrate these ideas.
Author
Computational Grids; Convergence; Mathematical Models; Aerodynamic Configurations; Computational Fluid Dynamics; Wind Tunnel Tests; Aerodynamic Drag

20080014303 NASA Langley Research Center, Hampton, VA, USA
Managing Flap Vortices via Separation Control
Greenblatt, David; AIAA Journal; [2006]; Volume 44, No. 11, pp. 2755-2764; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-064-10-34; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014303

A pilot study was conducted on a flapped semi-span model to investigate the concept and viability of near-wake vortex management by means of boundary layer separation control. Passive control was achieved using a simple fairing and active control was achieved via zero mass-flux blowing slots. Vortex sheet strength, estimated by integrating surface pressures, was

used to predict vortex characteristics based on inviscid rollup relations and vortices trailing the flaps were mapped using a seven-hole probe. Separation control was found to have a marked effect on vortex location, strength, tangential velocity, axial velocity and size over a wide range of angles of attack and control conditions. In general, the vortex trends were well predicted by the inviscid rollup relations. Manipulation of the separated flow near the flap edges exerted significant control over either outboard or inboard edge vortices while producing small lift and moment excursions. Unsteady surface pressures indicated that dynamic separation and attachment control can be exploited to perturb vortices at wavelengths shorter than a typical wingspan. In summary, separation control has the potential for application to time-independent or time-dependent wake alleviation schemes, where the latter can be deployed to minimize adverse effects on ride-quality and dynamic structural loading.
Author
Separated Flow; Vortex Sheets; Vortices; Semispan Models; Mathematical Models; Flaps (Control Surfaces); Boundary Layer Control

20080014307 NASA Glenn Research Center, Cleveland, OH, USA
Computational Investigation of the NASA Cascade Cyclonic Separation Device
Hoyt, Nathaniel C.; Kamotani, Yasuhiro; Kadambi, Jaikrishnan; McQuillen, John B.; Sankovic, John M.; [2008]; 10 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): NNC05HA08H; WBS 820855.04.01.03.01
Report No.(s): AIAA Paper 2008-0809; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014307

Devices designed to replace the absent buoyancy separation mechanism within a microgravity environment are of considerable interest to NASA as the functionality of many spacecraft systems are dependent on the proper sequestration of interpenetrating gas and liquid phases. Inasmuch, a full multifluid Euler-Euler computational fluid dynamics investigation has been undertaken to evaluate the performance characteristics of one such device, the Cascade Cyclonic Separator, across a full range of inlet volumetric quality with combined volumetric injection rates varying from 1 L/min to 20 L/min. These simulations have delimited the general modes of operation of this class of devices and have proven able to describe the complicated vortex structure and induced pressure gradients that arise. The computational work has furthermore been utilized to analyze design modifications that enhance the overall performance of these devices. The promising results indicate that proper CFD modeling may be successfully used as a tool for microgravity separator design.
Author
Separators; Computational Fluid Dynamics; Pressure Gradients; Vapor Phases; Buoyancy; Liquid Phases

20080014425 Air Force Research Lab., Edwards AFB, CA USA
The Impact of Manifold-to-Orifice Turning Angle on Sharp-Edge Orifice Flow Characteristics in both Cavitation and Non-Cavitation Turbulent Flow Regimes (Preprint)
Nurick, W H; Ohanian, T; Talley, D G; Strakey, P A; Jun 2007; 21 pp.; In English
Contract(s)/Grant(s): Proj-5026
Report No.(s): AD-A475796; AFRL-PR-ED-JA-2007-325; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475796

The approach taken was to analyze the results in a manner consistent with application by design engineers to new and existing applications, while providing some insight into the processes that are occurring. This paper deals with predicting the initiation of cavitation, cavitation impacts on Cc, and non-cavitation impacts on Cd from L/D of 5 sharp-edge orifices with both single angle and compound angle directional flow. The results show that in the cavitation regime, Cc is controlled by the cavitation number, where the data follows the power with Kcav, and inception of cavitation occurs at a Kcav of 1.8. In the non-cavitation regime Cd is controlled by Reynolds number, and the head loss coefficient, KL for all angles is a function of the manifold-to-orifice velocity ratio. Compound angle orifices Cc and KL were found to be influenced more by the initial turning angle than the orifice turning angle. In the non-cavitation regime for conditions where the cross velocity is 0 the data are consistent with the first order equation relating HL to the dynamic pressure where KL is constant, which is consistent with in-line orifices.
DTIC
Cavitation Flow; Flow Characteristics; Orifice Flow; Orifices; Turbulent Flow

20080014544 Case Western Reserve Univ., Cleveland, OH USA
Experiments on the Receptivity of Transient Disturbances to Surface Roughness and Freestream Turbulence
White, Edward B; Jan 2008; 50 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0048
Report No.(s): AD-A476059; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476059

Transient growth is a boundary-layer instability mechanism that leads to algebraic growth of disturbances generated by surface roughness and freestream turbulence. An earlier research program verified that stationary, roughness-induced disturbances undergo transient growth but that these disturbances are sub-optimal and depend critically on the details of the receptivity process. This project seeks to provide a more complete understanding of the receptivity of transient disturbances to regular and random surface roughness as well as freestream turbulence. This objective is pursued through three separate tracks. First, a technique is developed to permit a rigorous decomposition of measured steady disturbances across the continuous spectrum of Orr-Sommerfeld/Squire eigenmodes. Second, the receptivity and transient growth of steady disturbances generated by quasi-random distributed surface roughness is investigated. Third, transient disturbances generated by controlled freestream turbulence are to be investigated.
DTIC
Free Flow; Surface Roughness; Turbulence

20080014855 NASA Langley Research Center, Hampton, VA, USA
Efficient Construction of Discrete Adjoint Operators on Unstructured Grids by Using Complex Variables
Nielsen, Eric J.; Kleb, William L.; January 2005; 15 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-064-10-30; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014855

A methodology is developed and implemented to mitigate the lengthy software development cycle typically associated with constructing a discrete adjoint solver for aerodynamic simulations. The approach is based on a complex-variable formulation that enables straightforward differentiation of complicated real-valued functions. An automated scripting process is used to create the complex-variable form of the set of discrete equations. An efficient method for assembling the residual and cost function linearizations is developed. The accuracy of the implementation is verified through comparisons with a discrete direct method as well as a previously developed handcoded discrete adjoint approach. Comparisons are also shown for a large-scale configuration to establish the computational efficiency of the present scheme. To ultimately demonstrate the power of the approach, the implementation is extended to high temperature gas flows in chemical nonequilibrium. Finally, several fruitful research and development avenues enabled by the current work are suggested.
Author
Complex Variables; Software Engineering; Unstructured Grids (Mathematics); Computational Fluid Dynamics; Discretization (Mathematics); Operators (Mathematics)

20080014860 NASA Langley Research Center, Hampton, VA, USA
Numerical Investigation of Flow in an Over-expanded Nozzle with Porous Surfaces
Abdol-Hamid, Khaled S.; Elmilingui, Alaa A.; Hunter, Craig A.; January 2006; 17 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 23-561.581.02.08.07; Copyright; Avail.: CASI: A03, Hardcopy

A new porous condition has been implemented in the PAB3D solver for simulating the flow over porous surfaces. The newly-added boundary condition is utilized to compute the flow field of a non-axisymmetric, convergent-divergent nozzle incorporating porous cavities for shock-boundary layer interaction control. The nozzle has an expansion ratio (exit area/throat area) of 1.797 and a design nozzle pressure ratio of 8.78. The flow fields for a baseline nozzle (no porosity) and for a nozzle with porous surfaces (10% porosity ratio) are computed for NPR varying from 2.01 to 9.54. Computational model results indicate that the over-expanded nozzle flow is dominated by shock-induced boundary-layer separation. Porous configurations are capable of controlling off-design separation in the nozzle by encouraging stable separation of the exhaust flow. Computational simulation results, wall centerline pressure, mach contours, and thrust efficiency ratio are presented and discussed. Computed results are in excellent agreement with experimental data.
Author
Nozzle Flow; Porosity; Numerical Analysis; Flow Distribution; Convergent-Divergent Nozzles; Two Dimensional Flow

20080015644 NASA Marshall Space Flight Center, Huntsville, AL, USA

Recent Updates to the Fission Surface Power Primary Test Circuit (FSP-PTC)

Garber, Anne E.; February 10, 2008; 22 pp.; In English; Space Technology and Applications International Forum (STAIF-2008),, 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015644

An actively pumped alkali metal flow circuit, designed and fabricated at the NASA Marshall Space Flight Center, underwent a range of tests at MSFC in early 2007. During this period, system transient responses and the performance of the liquid metal pump were evaluated. In May of 2007, the circuit was drained and cleaned to prepare for multiple modifications: the addition of larger upper and lower reservoirs, the installation of an annular linear induction pump (ALIP), and the inclusion of a closeable orifice in the test section. Modifications are now complete and testing has resumed. Performance of the ALIP, provided by Idaho National Laboratory (1NL), is the subject of the first round of experimentation. This presentation details the physical changes made to the FSP-PTC and the current test program.

Author

Alkali Metals; Reservoirs; Liquid Metals; Transient Response; Pumps; Fission; Test Chambers

20080015652 Boeing Aerospace Co., Huntington Beach, CA, USA

CFD Modeling of Helium Pressurant Effects on Cryogenic Tank Pressure Rise Rates in Normal Gravity

Grayson, Gary; Lopez, Alfredo; Chandler, Frank; Hastings, Leon; Hedayat, Ali; Brethour, James; July 08, 2007; 10 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNM05AB18C; Copyright; Avail.: CASI: A02, Hardcopy

A recently developed computational fluid dynamics modeling capability for cryogenic tanks is used to simulate both self-pressurization from external heating and also depressurization from thermodynamic vent operation. Axisymmetric models using a modified version of the commercially available FLOW-3D software are used to simulate actual physical tests. The models assume an incompressible liquid phase with density that is a function of temperature only. A fully compressible formulation is used for the ullage gas mixture that contains both condensable vapor and a noncondensable gas component. The tests, conducted at the NASA Marshall Space Flight Center, include both liquid hydrogen and nitrogen in tanks with ullage gas mixtures of each liquid's vapor and helium. Pressure and temperature predictions from the model are compared to sensor measurements from the tests and a good agreement is achieved. This further establishes the accuracy of the developed FLOW-3D based modeling approach for cryogenic systems.

Author

Cryogenics; Computational Fluid Dynamics; Pressure Reduction; Thermodynamics; Gas Mixtures; Noncondensable Gases; Liquid Phases; Liquid Hydrogen; Fuel Tanks

20080015654 NASA Marshall Space Flight Center, Huntsville, AL, USA

Modifications and Modelling of the Fission Surface Power Primary Test Circuit (FSP-PTC)

Garber, Ann E.; February 10, 2008; 1 pp.; In English; 2008 Space Technology and Applications International Forum (STAIF), 10-14 Feb. 2008, Albuquerque, Mexico; No Copyright; Avail.: Other Sources; Abstract Only

An actively pumped alkali metal flow circuit, designed and fabricated at the NASA Marshall Space Flight Center, underwent a range of tests at MSFC in early 2007. During this period, system transient responses and the performance of the liquid metal pump were evaluated. In May of 2007, the circuit was drained and cleaned to prepare for multiple modifications: the addition of larger upper and lower reservoirs, the installation of an annular linear induction pump (ALIP), and the inclusion of the Single Flow Cell Test Apparatus (SFCTA) in the test section. Performance of the ALIP, provided by Idaho National Laboratory (INL), will be evaluated when testing resumes. The SFCTA, which will be tested simultaneously, will provide data on alkali metal flow behavior through the simulated core channels and assist in the development of a second generation thermal simulator. Additionally, data from the first round of testing has been used to refine the working system model, developed using the Generalized Fluid System Simulation Program (GFSSP). This paper covers the modifications of the FSP-PTC and the updated GFSSP system model.

Author

Fission; Circuits; Alkali Metals; Transient Response; Liquid Metals; Reservoirs

20080015666 NASA Marshall Space Flight Center, Huntsville, AL, USA

Gravity Scaling of a Power Reactor Water Shield

Reid, Robert S.; Pearson, J. Boise; February 10, 2008; 9 pp.; In English; Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015666

Water based reactor shielding is being considered as an affordable option for use on initial lunar surface power systems. Heat dissipation in the shield from nuclear sources must be rejected by an auxiliary thermal hydraulic cooling system. The mechanism for transferring heat through the shield is natural convection between the core surface and an array of thermosyphon radiator elements. Natural convection in a 100 kWt lunar surface reactor shield design has been previously evaluated at lower power levels (Pearson, 2007). The current baseline assumes that 5.5 kW are dissipated in the water shield, the preponderance on the core surface, but with some volumetric heating in the naturally circulating water as well. This power is rejected by a radiator located above the shield with a surface temperature of 370 K. A similarity analysis on a water-based reactor shield is presented examining the effect of gravity on free convection between a radiation shield inner vessel and a radiation shield outer vessel boundaries. Two approaches established similarity: 1) direct scaling of Rayleigh number equates gravity-surface heat flux products, 2) temperature difference between the wall and thermal boundary layer held constant on Earth and the Moon. Nussult number for natural convection (laminar and turbulent) is assumed of form Nu = CRa(sup n). These combined results estimate similarity conditions under Earth and Lunar gravities. The influence of reduced gravity on the performance of thermosyphon heat pipes is also examined.

Author

Reactor Design; Power Reactors; Lunar Surface; Shielding; Cooling Systems; Heat Flux; Gravitational Effects

20080015667 NASA Marshall Space Flight Center, Huntsville, AL, USA

Advanced Thermal Simulator Testing: Thermal Analysis and Test Results

Bragg-Sitton, Shannon M.; Dickens, Ricky; Dixon, David; Reid, Robert; Adams, Mike; Davis, Joe; February 10, 2008; 12 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, , Albuquerque, NM; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015667

Work at the NASA Marshall Space Flight Center seeks to develop high fidelity, electrically heated thermal simulators that represent fuel elements in a nuclear reactor design to support non-nuclear testing applicable to the development of a space nuclear power or propulsion system. Comparison between the fuel pins and thermal simulators is made at the outer fuel clad surface, which corresponds to the outer sheath surface in the thermal simulator. The thermal simulators that are currently being tested correspond to a SNAP derivative reactor design that could be applied for Lunar surface power. These simulators are designed to meet the geometric and power requirements of a proposed surface power reactor design, accommodate testing of various axial power profiles, and incorporate imbedded instrumentation. This paper reports the results of thermal simulator analysis and testing in a bare element configuration, which does not incorporate active heat removal, and testing in a water-cooled calorimeter designed to mimic the heat removal that would be experienced in a reactor core.

Author

Thermal Analysis; Nuclear Reactors; Reactor Design; Simulators; Solar Generators; Reactor Cores; Power Reactors; Nuclear Propulsion; Spacecraft Power Supplies

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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*.

20080014317 NASA Langley Research Center, Hampton, VA, USA

Scene Context Dependency of Pattern Constancy of Time Series Imagery

Woodell, Glenn A.; Jobson, Daniel J.; Rahman, Zia-ur; March 16, 2008; 13 pp.; In English; SPIE Defense and Security Symposium 2008, 16-20 Mar. 2008, Orlando, FL, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 526282.01.07.04.19; Copyright; Avail.: CASI: A03, Hardcopy

A fundamental element of future generic pattern recognition technology is the ability to extract similar patterns for the

same scene despite wide ranging extraneous variables, including lighting, turbidity, sensor exposure variations, and signal noise. In the process of demonstrating pattern constancy of this kind for retinex/visual servo (RVS) image enhancement processing, we found that the pattern constancy performance depended somewhat on scene content. Most notably, the scene topography and, in particular, the scale and extent of the topography in an image, affects the pattern constancy the most. This paper will explore these effects in more depth and present experimental data from several time series tests. These results further quantify the impact of topography on pattern constancy. Despite this residual inconstancy, the results of overall pattern constancy testing support the idea that RVS image processing can be a universal front-end for generic visual pattern recognition. While the effects on pattern constancy were significant, the RVS processing still does achieve a high degree of pattern constancy over a wide spectrum of scene content diversity, and wide ranging extraneousness variations in lighting, turbidity, and sensor exposure.
Author
Image Enhancement; Image Processing; Imagery; Pattern Recognition; Time Series Analysis; Scene Analysis; Aerospace Safety; Instruments

20080014400 Space Micro, Inc., San Diego, CA USA
Geometrically Optimized LaBr3:Ce Scintillation Sensor Array for Enhanced Stand-Off Direction Finding of Gamma Radiation Sources
Winso, James H; Ackermann, Eric S; Fennell, Michael; Perez, Roger; Rolando, John; Pagey, Manish; Polichar, Raulf; Martinez, Juan; Hovgaard, Jens; Kogut, Greg; Jan 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NBCHC060045; NBCHC070028
Report No.(s): AD-A475721; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475721

A Radiation Source Identification and Targeting (RadSITE[TradeMark]) innovation has been conceptually demonstrated that remotely detects and identifies one or more Localized Gamma Sources simultaneously and also provides Azimuth Directions of each source. The innovation exploits the superior energy resolution of Cerium Doped Lanthanum Bromide (LaBr3:Ce) Scintillators to select only photons emanating directly from the localized source(s). Laboratory Bench Testing provided physical confirmation that an array of unique, elongated geometry, LaBr3:Ce sensors performed as predicted by MCNP Modeling to resolve source azimuth direction. The response of each sensor element is anisotropic providing a response dependent on the azimuth of the source relative to the sensor, while the integrated response of the entire array is isotropic, providing a source strength-distance indicator to act as a reference for an original software algorithm that processes each isotope response to determine azimuth. Laboratory tests have confirmed that an array of four (4) sensors would be sufficient to provide plus or minus 5 degree azimuth determination over a 360 degree field of view. The approach accommodates a large volume of scintillation material with minimal shielding <20% compared to about 50% for Coded Aperture approaches to provide a high sensitivity and a wide (360 degree) field of view. This Patent Pending innovation has been integrated with an iRobot ATRV Robotic Platform and autonomous approach to isotopic sources in a field environment has been demonstrated.
DTIC
Direction Finding; Gamma Rays; Radiation Sources; Scintillation

20080014413 Naval Research Lab., Washington, DC USA
Performance Analysis of Recurrence Matrix Statistics for the Detection of Deterministic Signals in Noise
Michalowicz, Joseph V; Nichols, Jonathan M; Bucholtz, Frank; Jan 4, 2008; 33 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475758; NRL/MR/5650-08-9098; XB-NRL/MR/5670; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475758

Understanding the limitations to detecting deterministic signals in the presence of noise, especially additive, white Gaussian noise, is of importance for the design of LPI systems and anti-LPI signal defense. In this report, we investigate the use of recurrence plots for such detection, and we compare the performance of a recurrence-plot-based detector to a standard power-detection approach. Performance is evaluated using receiver-operator characteristic (ROC) curves.
DTIC
Detection; Random Noise; Reliability Analysis; Signal Detection; White Noise

20080014437 Michigan Univ., Ann Arbor, MI USA

Core Development Integration and Demonstration of the DARPA Virtual Soldier

Athey, Brian D; Sep 1, 2006; 332 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-2-0012

Report No.(s): AD-A475814; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475814

Two demonstrations of the capabilities developed under Cooperative Agreement Contract W81XH-04-0012, 'Core Development Integration and Demonstration of the DARPA Virtual Soldier' (The Virtual Soldier Project) were performed as final deliverables. The March 17th 2005 Demonstration targeted 5 areas: Statistical Reasoning, Multiscale Modeling, Casual Reasoning, P-Tag-CODEC-Homer Displays-Hotbox, and Autostereoscopic/ Holographic Display. The 14 June 2005 Demonstration targeted 3 areas: (1) An End-to-End Demonstration of Statistical Reasoning, (2) Multiscale Modeling and Anatomy from Anatomy Forecasts with Autopsy Results and a Report of Statistical Findings, and (3) a Casual Reasoning demonstration using the Virtual Soldier Knowledge Base, simulated physiology data, and ballistic modeling. The 7 Tasks of the project: (1) Global Architecture, (2) Organ-tissue systems, (3) Property-levels model, (4) Automatic segmentation of organ-tissue systems, (5) Holomer display and interface, (6) Holomer storage, retrieval and interface, and (7) Demonstration; have been met in fulfillment of the main contract demonstration goal of statistical prediction of outcomes to an accuracy greater than 0.80. Subcontractors developed the software and model systems to achieve the required degree of faithfulness to physiology, anatomy, physical properties, and anatomy information hierarchy to statistically predict wounding outcomes from minimal post-wound experimental data, and to separately describe post-wound effects from initial wound states.

DTIC

Inference; Injuries; Mathematical Models

20080014476 Naval Postgraduate School, Monterey, CA USA

High Doppler Resolution Imaging by Multistatic Continuous Wave Radars Using Constructive Techniques

Soh, Wei T; Dec 2007; 95 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475911; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475911

The multistatic radar offers many advantages over monostatic radar in certain applications, especially since the receiving stations may be located at covert and distant sites relative to the transmitting stations. Furthermore, continuous wave radars are relatively simple and inexpensive to employ and maintain. Hence, the impetus for developing a CW multistatic radar system for high-resolution imaging was conceived. This thesis is a proof of concept demonstration that a Doppler-only multistatic radar system can be employed to provide high resolution imaging of airborne targets in support of non-cooperative target recognition. Through an understanding of conventional imaging techniques and formulation of the inverse problem in radar imaging, a demonstration radar model based on one transmitter and two receivers was designed to determine the accurate position and velocity of simulated targets. The extraction errors resulted from the range, bearing and velocity measurements were congruent with the physical limitations of each transmitter-receiver pair. Through the employment of a multistatic system, the geometrical diversity allowed these limitations to be overcome.

DTIC

Continuous Radiation; Continuous Wave Radar; High Resolution; Imaging Techniques

20080014483 Naval Postgraduate School, Monterey, CA USA

ISAR Imaging Using Fourier and Wavelet Transforms

Lucrecio, Armando J; Dec 2007; 81 pp.; In English

Report No.(s): AD-A475926; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475926

We investigate the ISAR imaging model using two different approaches the Fourier and the wavelet transform. Starting from the weak-scatter far-field model we explain why this approximation it's a Fourier Transform. We investigate the scattering mechanisms from different surfaces. We also analyze and derived the expressions of the scatter from sphere. We briefly discuss the radon transform and why it's not a good approach to our problem. We investigate the results using this time-frequency methods, creating images using synthetic data.

DTIC

Fourier Transformation; Imaging Techniques; Radar Imagery; Synthetic Aperture Radar; Wavelet Analysis

20080014521 Naval Postgraduate School, Monterey, CA USA

Estimations of Atmospheric Conditions for Input to the Radar Performance Surface

Jr, Frank D Price; Dec 2007; 81 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476017; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476017

This study addresses the support of non-acoustic ASW operations by timely atmospheric and ocean surface descriptions on features that impact radar and electro-optical sensor systems. The first part of this study is an analysis of meteorology and oceanography (METOC) data collected off Wallops Island, VA. A second part is a description of data and procedures applied in a Proof of Concept for a Radar Performance Surface developed and executed at NPS for the Pacific Fleet exercise Valiant Shield 2007 for periscope detection. In both field experiments NPS employed METOC instruments and personnel in theater to collect in situ truth data for the ocean and atmosphere. Evaluated are the sensitivities of the parameters that serve as the input to the performance surface. Surface parameters as predicted by the Navy s Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS) are compared to in-situ data to assess the sensitivities of air-sea temperature differences and relative humidity errors on predictions of ducting, super and sub-refractive conditions. Addressed are atmospheric measurement techniques, use of climatology and numerical modeling as the input to the Radar Performance Surface. This study evaluates the degree of which mesoscale models can accurately predict the true predicted propagation conditions based on comparisons with in situ data. A statistical summary shows COAMPS data has sufficient skill when compared to in situ data.

DTIC

Atmospherics; Estimates; Meteorology; Radar

20080014529 Naval Postgraduate School, Monterey, CA USA

Imaging and Reflectance Spectroscopy for the Evaluation of Effective Camouflage in the SWIR

Leong, Ho C; Dec 2007; 85 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476038

The emergence of SWIR (short-wave infrared) sensors and ongoing development of multi-spectral imagers that operate across four wavebands (visible, NIR, SWIR and MWIR) pose new challenges for current camouflage, concealment and deception technologies. For one, they render ineffective conventional camouflage material that worked well in the visible part of the spectrum. The aim of this thesis is to propose means to provide effective camouflage across the visible and SWIR spectrum. A system was developed for combined imagery and spectral reflectance measurements for the visible and the SWIR regions. The system utilizes an InGaAs focal plane array with a response range from 400 to 1700 nm. Experiments were conducted to study the reflectance of materials (e.g. foliage and current camouflage materials) across the two spectrums. From these experiments, the desired properties for camouflage materials were established. It is then proposed that a layer of nanomesh be used to complement current camouflage material in order to maintain the reflectance contrast between various dyes in the SWIR. The modified

DTIC

Camouflage; Imaging Techniques; Infrared Imagery; Reflectance; Spectroscopy

20080014694 Stevens Inst. of Tech., Hoboken, NJ USA

The Stevens Integrated Maritime Surveillance Forecast System: Expansion and Enhancement

Bruno, Michael S; Blumberg, Alan F; Jan 2006; 13 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0633

Report No.(s): AD-A476297; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long-term goal of the project is to develop an advanced, integrated system of oceanographic, meteorological, and vessel surveillance sensors and littoral ocean forecasting models to allow for the real-time assessment of ocean, weather, environmental, and vessel traffic conditions throughout the New York Harbor region, and the forecast of conditions in the near and long-term and under specific threat scenarios. In the long-term, the observation and modeling systems will be linked in a unique fashion, whereby the model forecast system will be enhanced by data assimilation, and the observing system will be enhanced by model-directed observations and model-assisted data interpolation. During the year under report, the objective was to enhance and expand an existing observing and forecasting system of New York Harbor that is used to support both safe navigation and port security. The system is structured to enable real-time and ongoing changes to the sampling scheme of the observation system, based on model forecasts and/or user intervention primary objectives of the past year's effort included the installation of an HF RADAR system to provide synoptic measurements of surface currents in the Lower Harbor, improved

wireless data transmission, installation of a CTD sensor on a Harbor vessel, and the development of sophisticated model-assisted data interpolation and graphics.
DTIC
Augmentation; Detectors; Forecasting; Ocean Models; Radar; Surveillance

20080014708 Johns Hopkins Univ., Laurel, MD USA
Moving Belt Metal Detector (MBMD)
Nelson, Carl V; Mendat, Deborah P; Huynh, Toan B; Mar 2006; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W912HQ-05-C-0007
Report No.(s): AD-A476325; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Johns Hopkins University Applied Physics Laboratory (JHU/APL) has developed a prototype metal detection survey system that will increase the search speed of conventional technology while maintaining high sensitivity. Higher search speeds will reduce the time to locate unexploded ordnance (UXO) at Base Realignment and Closure (BRAC) sites, thus potentially reducing remediation costs. The new survey sensor system is called the moving belt metal detector (MBMD) and operates by both increasing sensor speed over the ground while maintaining adequate sensor dwell time over the target for good signal-to-noise ration (SNR) and reducing motion-induced sensor noise. The MBMD uses an array of metal detection sensors mounted on a flexible belt similar to a tank track. The belt motion is synchronized with the forward survey speed so individual sensor elements remain stationary relative to the ground. In the prototype MBMD, a single pulsed transmitter coil is configured to provide a uniform magnetic field along the length of the receivers in ground contact. Individual time-domain electromagnetic induction (EMI) receivers are designed to sense a single time-gate measurement of the total metal content. Each sensor module consists of a receiver coil, amplifier, digitizing electronics and a low power UHF wireless transmitter. This report presents the survey system design concepts, details of the prototype system, metal detection data from at several survey speeds and recommendations for future work. Although the laboratory prototype is designed to demonstrate metal detection survey speeds up to 10 m/s, higher speeds are achievable with a larger sensor array. In addition, the concept can be adapted to work with other sensor technologies not previously considered for moving platforms.
DTIC
Ammunition; Transmitters

20080014709 Johns Hopkins Univ., Laurel, MD USA
Three-Dimensional Steerable Magnetic Field (3DSMF) Sensor System for Classification of Buried Metal Targets
Nelson, Carl V; Mendat, Deborah P; Huynh, Toan B; Ramac-Thomas, Liane C; Beaty, James D; Craig, Joseph N; Jul 2006; 77 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DACA72-02-C-0030
Report No.(s): AD-A476327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Most EMI sensors do not take advantage of all the available information that is inherent in the metal target response. The sensors tend to measure only a single dimension of a target response or, in the case of a spatially scanned target, try to infer a multi dimensional response. Experimental EMI sensors that do attempt to generate a 3D magnetic field and measure a 3D target response do so with magnetic field antennas that have fixed and complex spatial magnetic field distributions With a conventional pulsed EMI metal detector, a current loop transmitter is placed in the vicinity of the buried metal target, and steady current flows in the transmitter for a sufficiently long time to allow the turn-on transients in the soil to dissipate. The transmitter loop current is then turned off. According to Faraday's Law, the collapsing magnetic field induces an electromotive force (emf) in nearby conductors, such as the metal target. This emf causes eddy currents to flow in the conductor. Because there is no energy to sustain the eddy currents, they begin to decrease with a characteristic decay time that depends on the size, shape, and electrical and magnetic properties of the conductor. The decay currents generate a secondary magnetic field that is detected by a magnetic field receiver located above the ground and coupled to the transmitter via a data acquisition and control system. The direction of the magnetic field and the field strength generated by a conventional loop EMI metal detector are a complex function of the distance of the antenna to the target. As the antenna is moved over the target, data are collected from different antenna-target aspect angles. An automatic target recognition (ATR) algorithm attempts to combine the measured time or frequency signature from the target with the spatial data to perform target classification.
DTIC
Classifications; Magnetic Fields; Measurement; Targets

20080014714 Arkansas Univ., Fayetteville, AR USA

New Approaches to the Use and Integration of Multi-Sensor Remote Sensing for Historic Resource Identification and Evaluation

Kvamme, Kenneth; Ernenwein, Eileen; Hargrave, Michael; Sever, Thomas; Harmon, Deborah; Limp, Frederick; Howell, Burgess; Koons, Michele; Tullis, Jason; Nov 10, 2006; 395 pp.; In English

Contract(s)/Grant(s): DACA72-02-C-0035; Proj-CS-1263

Report No.(s): AD-A476333; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is the final report on a SERDP research project whose focus is the identification of specific combinations of remote sensors and data integration methods for the detection, identification, and interpretation of cultural resources in various environments and archaeological circumstances. The extensive suite of sensor technologies employed for this task include magnetometry, magnetic susceptibility, electrical resistivity, electromagnetic conductivity, ground penetrating radar, aerial thermal infrared and high resolution multispectral satellite imagery. The results of the research illustrate the very substantive subsurface site characteristics that are discoverable from integrative methods used. Based on these results a dramatically clearer picture of the subsurface is realized, compared to traditional site evaluative methods. By more clearly imaging the totality of information about the subsurface from all sources, a better understanding of site content, structure, and organization may also be achieved.

DTIC

Detection; Multisensor Applications; Remote Sensing

20080015456 Opto-Knowledge Systems, Inc., Torrance, CA USA

Variable Cold Stop for Matching IR Cameras to Multiple f-number Optics

Gat, Nahum; Zhang, Jingyi; Li, Ming D; Chen, Liang; Gurrola, Hector; Apr 2007; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476286; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cameras operating in the thermal infrared (mid-wave and long-wave IR) use a cold stop that is designed to match the exit pupil of the optics and thus avoid parasitic radiation or vignetting. For years, range operators have been using reflective telescopes, usually with photo-documentation film cameras. Along with the need to shift operation into the infrared comes a problem that (i) these telescopes do not have an exit pupil located at the IR camera cold stop, and (ii) most IR cameras have f/2 or f/4 stop, while the telescope is typically f/7 or greater. These mismatches cause a significant deterioration of the system performance and picture quality. A similar need arises when using zoom optics with IR cameras where, as the field of view changes, so does the optics f/#, creating a mismatch with the camera that has a fixed aperture. The OKSI/WSMR team has demonstrated two implementations of a patented continuous variable aperture / cold stop (CVA/CS or VariAp[registered]) for operating IR cameras with different f/# optics. Two systems were built: (1) an optical relay assembly with an external CVA/CS, and (2) a custom 1024 1024 pixel MWIR camera with a built in CVA/CS and the proper relay optics to match the telescope optics to the camera. The first optical relay with the VariAp is a retrofit for legacy IR cameras for operations with reflective telescopes. The camera with the built-in VariAp can function with both reflective (using an additional external relay) and refractive (with no additional relay) telescopes. The paper describes the two systems that open new possibilities in IR imaging for various ranges.

DTIC

Cameras; Infrared Radiation; Telescopes; Zoom Lenses

20080015609 Army Research Development and Engineering Command, Warren, MI USA

MDA Ice Detection and Measurement Camera Development and Validation for NASA-KSC (2004-2007)

Meitzler, Thomas; Bryk, Darryl; Sohn, Euijung; Bienkowski, Mary; Lane, Kimberly; Charbeneau, Michele; Smith, Gregory; Ragusa, James; Bienkowski, Mary; Aug 17, 2007; 102 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476326; 17675; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The formation of frost, ice, and ice balls are common occurrences on the insulated External Tank (ET) of the Space Transportation System (STS) during National Aeronautics and Space Administration (NASA)-Kennedy Space Center (KSC), Florida launch preparations. The metal ET tank, 154 ft. tall and 27.5 ft. in diameter, is covered by insulating Sprayed On Foam Insulation (SOFI). However, internal ET fuel and oxidizer tanks contain large quantities of cryogens-in this case super cold liquid hydrogen (LH2) at minus 4230F and liquid oxygen (LO2) at minus 2970F. Complicating matters are Florida's humid and sometime cold weather that through condensation, support the formation of frost and ice. Although ice formation on the shuttle is more of a problem in the winter months, ice balls can form even in the hot summer months, because of cracks, voids, or other defects that may be present in the ET foam. Ice is a critical safety concern because of the possibility of it breaking

off the ET at liftoff or during early vehicle assent. Falling ice could strike and possibly damage the Orbiter crew compartment windows, Reinforced Carbon-Carbon (RCC) panels on the leading edge of the Orbiter's wings, or its thermal protection tiles, thus placing the crew and vehicle at risk.
DTIC
Cameras; Detection; Ice; Ice Formation; Measurement

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*.

20080014419 Naval Postgraduate School, Monterey, CA USA
Free Electron Laser Performance with Quadruple Magnet Misalignment from Shipboard Vibrations
Burggraff, David T; Dec 1, 2007; 79 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475780; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475780

The Free Electron Laser (FEL) has been discussed and studied in the USA Navy s directed energy weapon efforts. The goal of these studies is to use the FEL as a ship s primary defensive weapon against incoming threats such as missiles, aircraft and small boats. This thesis is an analysis of the effects of shipboard vibration on the performance of an FEL. The focus of this analysis will be on the performance degradation due to quadrupole magnet misalignments from ship vibrations and flexing. This study is aimed at improving system design efforts by determining the sensitivity of an FEL on magnet misalignments due to shipboard vibration and flexing. Simulations were conducted on the magnets placed along the electron beam path between the end of the accelerator and the beginning of the undulator. Simulations within this study were conducted using the 3D FEL simulator designed and programmed at the Navy Postgraduate School and FELSIM designed and managed by Advanced Energy Systems.
DTIC
Free Electron Lasers; Laser Outputs; Magnets; Misalignment; Vibration

20080014440 Naval Postgraduate School, Monterey, CA USA
Four Dimensional Analysis of Free Electron Lasers in the Amplifier Configuration
Aguilar, Juan M; Dec 2007; 81 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475820; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475820

Free electron lasers (FELs) are devices used worldwide for several purposes. In the military, especially in the Navy, they can be used for self-defense against missiles, and small boats. Installed on a ship, an FEL represents a multi-mission, deep magazine, long range weapon. This thesis will describe briefly the basic components and principles of operation. It also explores, by simulations, the effects of changing some of the parameters that generate the laser beam.
DTIC
Dimensional Analysis; Free Electron Lasers

20080014458 Naval Postgraduate School, Monterey, CA USA
Experiments on Laser Beam Jitter Control with Applications to a Shipboard Free Electron Laser
Bateman, Brett E; Dec 2007; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475858; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475858

A Free Electron Laser (FEL) shows potential as an effective defensive weapon for a naval ship against today s modern weapons such as supersonic anti-ship missiles. A laser can destroy these fast and highly maneuverable missiles at the speed of light. Several obstacles must be overcome to employ this weapon on a naval ship. This thesis discusses several methods for passive and active jitter control of a guided optical beam which might be employed in a FEL weapon system. Vibration experiments were performed on the Laser Jitter Control Testbed at the Naval Postgraduate School to test several types of feedback and adaptive feedforward controllers. A Filtered-X Recursive Least Squares (FXRLS) adaptive feedforward controller was found to be most effective to correct a combination of both broadband and narrowband disturbances. The

FXRLS controller results in a 33 dB decrease in jitter caused by a 50 Hz narrowband vibration and an 89% improvement in low frequency broadband jitter experienced by the optical beam. A proposed Free Electron Laser design employing both passive and active vibration control techniques is recommended that employs a co-linear optical reference beam for jitter control.
DTIC
Free Electron Lasers; Laser Beams; Optical Properties; Vibration

20080014554 Iowa State Univ. of Science and Technology, Ames, IA USA
Modeling of Flowing Plasmas and Pulse Power Schemes for O2(1Delta) Production for Chemical Lasers
Kushner, Mark J; Jan 19, 2008; 50 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0470
Report No.(s): AD-A476098; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476098

The objectives of the research program were met. Significant progress was made in improving our understanding of the plasma kinetics of O2(1Delta) production for pumping of eCOILs. Advances were made in 3 areas: (1) pulse power schemes, (2) use of additives and (3) high pressure operation. Methods and scaling laws were developed to optimize the yield of O2(1Delta) in flowing plasmas in each of these areas.
DTIC
Chemical Lasers; Dioxides; Plasmas (Physics)

20080014705 Defense Science Board, Washington, DC USA
Defense Science Board Task Force on Directed Energy Weapons
Schneider, Jr, William; Dec 2007; 98 pp.; In English
Report No.(s): AD-A476320; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Directed energy continues to offer promise as a transformational game changer as the Department of Defense (DOD) encounters new asymmetric and disruptive threats, while facing increasingly sophisticated traditional challenges. Yet years of investment have not resulted in any currently operational high-energy laser capability. In addition, the single high-energy laser program of record, the Airborne Laser (ABL) for boost phase missile defense, continues to experience delays and potential budget reductions. There is a strong belief in the directed energy community, and in segments of the warfighter and force-provider communities, that highpower microwave (HPM) offers capabilities in anti-sensor applications and as non-lethal weapons. Still, HPM advancement has been limited by uncertainty about its effects and effectiveness. Years of major investment in chemical lasers has produced megawatt-class systems that could have a wide range of applications. However, size, weight, and logistics issues limit them to integration on large platforms, such as the 747 used for the ABL program, or fixed ground applications such as the Ground-Based Laser for Space Control. As a consequence, interest in these systems and expectations of progress has significantly decreased. The current focus is on solid state lasers with the promise of providing for smaller, lighter systems with deep magazines. However, the current goal for solid state laser development would provide a power level more than an order of magnitude lower than current chemical lasers. While beam quality and other factors can compensate for some of the difference in power level, there is currently little investment in those aspects. Further, these cannot make up the delta in power of chemical vs. solid state lasers. The near-term projection for solid state lasers is a power level closer to two orders of magnitude below that of chemical lasers.
DTIC
Airborne Lasers; Chemical Lasers; High Power Lasers; Microwaves; Solid State Lasers; Weapon Systems

20080015396 NASA Langley Research Center, Hampton, VA, USA
One-Joule-per-Pulse Q-Switched 2-micron Solid State Laser
Yu, Jirong; Trieu, Bo C.; Modlin, Ed A.; Singh, Upendra N.; Kavaya, Michael J.; Chen, Songsheng; Bai, Yingxin; Petzar, Pual J.; Petros, Mulugeta; January 2005; 11 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Q-switched output of 1.1 J per pulse at 2-micron wavelength has been achieved in a diode pumped Ho:Tm:LuLF laser using a side-pumped rod configuration in a Master-Oscillator-Power-Amplifier (MOPA) architecture. This is the first time that a 2-micron laser has broken the Joule per pulse barrier for Q-switched operation. The total system efficiency reaches 5% and

6.2% for single and double pulse operation, respectively. The system produces excellent 1.4 times of transform limited beam quality.
Author
Laser Outputs; Q Switched Lasers; Solid State Lasers; Electrical Measurement; Energy; Laser Pumping; Diodes; Laser Beams

20080015568 National Defense Univ., Washington, DC USA
Effects of Directed Energy Weapons
Nielsen, Philip E; Jan 1994; 369 pp.; In English
Report No.(s): AD-A476195; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This book deals with the effects of directed energy weapons, treating such diverse types of weaponry as lasers, particle beams, microwaves, and even bullets. In order to understand these weapons and their effects, it is necessary first to develop a common framework for their analysis. It is a thesis of this book that all weapons may be understood as devices which deposit energy in targets, and that the energy which must be deposited to achieve a given level of damage is relatively insensitive to the type of weapon employed. Nuclear weapons may be characterized in terms of megatons, bullets in terms of muzzle velocity, and particle beams in terms of amperes of current, but when this jargon is reduced to common units for energy absorbed by a target, similar levels of damage are achieved at similar levels of energy deposited. Of course, energy cannot be deposited in a target unless it's first delivered there. Therefore, an important element in understanding weapons is a knowledge of how they deliver (or propagate) their energy. Some loss of energy is invariably associated with this propagation, whether it's the atmospheric drag on a bullet or the absorption of microwaves by raindrops. A weapon must therefore produce more energy than needed to damage a target, since some of its energy will be lost in propagation. As a result, weapon design depends upon two factors. First, the anticipated target, which determines the energy required for damage. And second, the anticipated scenario (range, engagement time, etc.) which determines how much energy must be produced to insure that an adequate amount is delivered in the time available. This chapter is devoted to developing this theme, introducing concepts and tools which will be used throughout the remainder of the book.
DTIC
Kinetic Energy; Lasers; Microwaves; Particle Beams; Projectiles; Weapon Systems

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*.

20080014293 NASA Langley Research Center, Hampton, VA, USA
Second Moment Closure Near the Two-component Limit
Rubinstein, Robert; Girimaji, Sharath S.; Journal of Fluid Mechanics; [2006]; Volume 548, pp. 197-206; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-065-30-11; Copyright; Avail.: CASI: A02, Hardcopy

The purpose of this paper is to explore some wider implications of the two-component limit for both single point turbulence models and spectral closure theories. Although the two-component limit arises most naturally in inhomogeneous problems like wall-bounded turbulence, the analysis will be restricted to homogeneous turbulence. But since homogeneous turbulence is the crucial case for realizability, the conclusions will nevertheless be applicable to modeling. Th essential point of our argument is that whereas the evolution of the stochastic velocity field is Markovian because it is governed by the Navier-Stokes equations, the exact stress evolution equation is not Markovian because it is unclosed. This property of moment evolution has been stressed by Kraichnan (1959). We will show that modeling stress evolution at the two-component limit with a closure that is Markovian in the stresses alone leads to basic inconsistencies in single-point modeling and, perhaps surprisingly, in spectral modes as well.
Derived from text
Homogeneous Turbulence; Turbulence Models; Stochastic Processes; Navier-Stokes Equation; Velocity Distribution

20080014322 NASA Johnson Space Center, Houston, TX, USA

Spacecraft Radiator Freeze Protection Using a Regenerative Heat Exchanger with Bypass Setpoint Temperature Control

Ungar, Eugene K.; [2008]; 12 pp.; In English; 38th International Conference on Environmental Systems, 29 Jun. - 3 Jul. 2007, San Francisco, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): 182306.06.01.10; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014322

Spacecraft radiators are sized for their maximum heat load in their warmest thermal environment, but must operate at reduced heat loads and in colder environments. For systems where the radiator environment can be colder than the working fluid freezing temperature, radiator freezing becomes an issue. Radiator freezing has not been a major issue for the Space Shuttle and the International Space Station (ISS) active thermal control systems (ATCSs) because they operate in environments that are warm relative to the freezing point of their external coolants (Freon-21 and ammonia, respectively). For a vehicle that lands at the Lunar South Pole, the design thermal environment is 215K, but the radiator working fluid must also be kept from freezing during the 0 K sink of transit. A radiator bypass flow control design such as those used on the Space Shuttle and ISS requires more than 30% of the design heat load to avoid radiator freezing during transit - even with a very low freezing point working fluid. By changing the traditional ATCS architecture to include a regenerating heat exchanger inboard of the radiator and by using a regenerator bypass flow control valve to maintain system setpoint, the required minimum heat load can be reduced by more than half. This gives the spacecraft much more flexibility in design and operation. The present work describes the regenerator bypass ATCS setpoint control methodology. It includes analytical results comparing the performance of this system to the traditional radiator bypass system. Finally, a summary of the advantages of the regenerator bypass system are presented.

Author

Bypasses; Freezing; Heat Exchangers; Protection; Spacecraft Radiators; Temperature Control; Regenerative Cooling

20080015379 National Inst. of Aerospace, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA

Performance Analysis on Fault Tolerant Control System

Shin, Jong-Yeob; Belcastro, Christine; January 2005; 16 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS1-02117; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015379

In a fault tolerant control (FTC) system, a parameter varying FTC law is reconfigured based on fault parameters estimated by fault detection and isolation (FDI) modules. FDI modules require some time to detect fault occurrences in aero-vehicle dynamics. In this paper, an FTC analysis framework is provided to calculate the upper bound of an induced-L(sub 2) norm of an FTC system with existence of false identification and detection time delay. The upper bound is written as a function of a fault detection time and exponential decay rates and has been used to determine which FTC law produces less performance degradation (tracking error) due to false identification. The analysis framework is applied for an FTC system of a HiMAT (Highly Maneuverable Aircraft Technology) vehicle. Index Terms fault tolerant control system, linear parameter varying system, HiMAT vehicle.

Author

Linear Parameter-Varying Control; Reliability Analysis; Fault Tolerance; Fault Detection; Modules; Decay Rates

20080015549 Army Research Lab., Cleveland, OH, USA; NASA Glenn Research Center, Cleveland, OH, USA

A Review of Engine Seal Performance and Requirements for Current and Future Army Engine Platforms

Delgado, Irebert R.; Proctor, Margaret P.; March 2008; 24 pp.; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, 8-11 July 2007, Cincinnati, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.15.02

Report No.(s): NASA/TM-2008-215161; ARL-TR-4201; AIAA Paper 2007-5734; E-16403; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015549

Sand ingestion continues to impact combat ground and air vehicles in military operations in the Middle East. The T-700 engine used in Apache and Blackhawk helicopters has been subjected to increased overhauls due to sand and dust ingestion during desert operations. Engine component wear includes compressor and turbine blades/vanes resulting in decreased engine power and efficiency. Engine labyrinth seals have also been subjected to sand and dust erosion resulting in tooth tip wear, increased clearances, and loss in efficiency. For the current investigation, a brief overview is given of the history of the T-700 engine development with respect to sand and dust ingestion requirements. The operational condition of labyrinth seals taken

out of service from 4 different locations of the T-700 engine during engine overhauls are examined. Collaborative efforts between the Army and NASA to improve turbine engine seal leakage and life capability are currently focused on noncontacting, low leakage, compliant designs. These new concepts should be evaluated for their tolerance to sand laden air. Future R&D efforts to improve seal erosion resistance and operation in desert environments are recommended
Author
Sands; Engine Parts; Ingestion (Engines); Erosion; Wear; Labyrinth Seals; Turbine Engines; Corrosion Resistance

20080015550 Georgia Southern Univ., Statesboro, GA, USA; NASA Glenn Research Center, Cleveland, OH, USA
Test Population Selection from Weibull-Based, Monte Carlo Simulations of Fatigue Life
Vlcek, Brian L.; Zaretsky, Erwin V.; Hendricks, Robert C.; April 07, 2008; 8 pp.; In English; 10th AIAA Non-Deterministic Approaches Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Fatigue life is probabilistic and not deterministic. Experimentally establishing the fatigue life of materials, components, and systems is both time consuming and costly. As a result, conclusions regarding fatigue life are often inferred from a statistically insufficient number of physical tests. A proposed methodology for comparing life results as a function of variability due to Weibull parameters, variability between successive trials, and variability due to size of the experimental population is presented. Using Monte Carlo simulation of randomly selected lives from a large Weibull distribution, the variation in the L10 fatigue life of aluminum alloy AL6061 rotating rod fatigue tests was determined as a function of population size. These results were compared to the L10 fatigue lives of small (10 each) populations from AL2024, AL7075 and AL6061. For aluminum alloy AL6061, a simple algebraic relationship was established for the upper and lower L10 fatigue life limits as a function of the number of specimens failed. For most engineering applications where less than 30 percent variability can be tolerated in the maximum and minimum values, at least 30 to 35 test samples are necessary. The variability of test results based on small sample sizes can be greater than actual differences, if any, that exists between materials and can result in erroneous conclusions. The fatigue life of AL2024 is statistically longer than AL6061 and AL7075. However, there is no statistical difference between the fatigue lives of AL6061 and AL7075 even though AL7075 had a fatigue life 30 percent greater than AL6061.
Author
Fatigue Life; Fatigue Tests; Monte Carlo Method; Weibull Density Functions; Aluminum Alloys; Metal Fatigue

20080015553 NASA Glenn Research Center, Cleveland, OH, USA
Interference Fit Life Factors for Roller Bearings
Oswald, Fred B.; Zaretsky, Erwin V.; Poplawski, Joseph V.; [2008]; 13 pp.; In English; STLE 2008, 63rd Annual Meeting and Exhibition, 18-22 May 2008, Cleveland, OH, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The effect of hoop stresses in reducing cylindrical roller bearing fatigue life was determined for various classes of inner ring interference fit. Calculations were performed for up to seven interference fit classes for each of ten bearing sizes. Each fit was taken at tightest, average and loosest values within the fit class for RBEC-5 tolerance, thus requiring 486 separate analyses. The hoop stresses were superimposed on the Hertzian principal stresses created by the applied radial load to calculate roller bearing fatigue life. The method was developed through a series of equations to calculate the life reduction for cylindrical roller bearings based on interference fit. All calculated lives are for zero initial bearing internal clearance. Any reduction in bearing clearance due to interference fit was compensated by increasing the initial (unmounted) clearance. Results are presented as tables and charts of life factors for bearings with light, moderate and heavy loads and interference fits ranging from extremely light to extremely heavy and for bearing accuracy class RBEC 5 (ISO class 5). Interference fits on the inner bearing ring of a cylindrical roller bearing can significantly reduce bearing fatigue life. In general, life factors are smaller (lower life) for bearings running under light load where the unfactored life is highest. The various bearing series within a particular bore size had almost identical interference fit life factors for a particular fit. The tightest fit at the high end of the RBEC-5 tolerance band defined in ANSI/ABMA shaft fit tables produces a life factor of approximately 0.40 for an inner-race maximum Hertz stress of 1200 MPa (175 ksi) and a life factor of 0.60 for an inner-race maximum Hertz stress of 2200 MPa (320 ksi). Interference fits also impact the maximum Hertz stress-life relation.
Author
Roller Bearings; Shafts (Machine Elements); Fatigue Life; Interference Fit; Stresses; Cylindrical Bodies

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20080014342 NASA Langley Research Center, Hampton, VA, USA
Status of Thermal NDT of Space Shuttle Materials at NASA
Cramer, K. Elliott; Winfree, William P.; Hodges, Kenneth; Koshti, Ajay; Ryan, Daniel; Reinhardt, Walter W.; April 17, 2006; 9 pp.; In English; Thermosense XXVIII, 17-21 Apr. 2006, Orlando, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 377816.06.03.03.05; Copyright; Avail.: CASI: A02, Hardcopy

Since the Space Shuttle Columbia accident, NASA has focused on improving advanced nondestructive evaluation (NDE) techniques for the Reinforced Carbon-Carbon (RCC) panels that comprise the orbiter's wing leading edge and nose cap. Various nondestructive inspection techniques have been used in the examination of the RCC, but thermography has emerged as an effective inspection alternative to more traditional methods. Thermography is a non-contact inspection method as compared to ultrasonic techniques which typically require the use of a coupling medium between the transducer and material. Like radiographic techniques, thermography can inspect large areas, but has the advantage of minimal safety concerns and the ability for single-sided measurements. Details of the analysis technique that has been developed to allow insitu inspection of a majority of shuttle RCC components is discussed. Additionally, validation testing, performed to quantify the performance of the system, will be discussed. Finally, the results of applying this technology to the Space Shuttle Discovery after its return from the STS-114 mission in July 2005 are discussed.
Author (revised)
Thermography; Nondestructive Tests; Space Shuttles; Carbon-Carbon Composites; Spacecraft Maintenance; Inspection

20080015440 NASA Glenn Research Center, Cleveland, OH, USA
Simultaneous Noncontact Precision Imaging of Microstructural and Thickness Variation in Dielectric Materials Using Terahertz Energy
Roth, Don J.; Seebo, Jeffrey P.; Winfree, William P.; March 2008; 25 pp.; In English; 34th Annual Review of Progress in Quantitative Nondestructive Evaluation, 22 Jul. - 27 Aug. 2006, Golden, CO, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 685676.02.99.03.01.01
Report No.(s): NASA/TM-2008-214997; E-16200; Copyright; Avail.: CASI: A03, Hardcopy

This article describes a noncontact single-sided terahertz electromagnetic measurement and imaging method that simultaneously characterizes microstructural (egs. spatially-lateral density) and thickness variation in dielectric (insulating) materials. The method was demonstrated for two materials-Space Shuttle External Tank sprayed-on foam insulation and a silicon nitride ceramic. It is believed that this method can be used as an inspection method for current and future NASA thermal protection system and other dielectric material inspection applications, where microstructural and thickness variation require precision mapping. Scale-up to more complex shapes such as cylindrical structures and structures with beveled regions would appear to be feasible.
Author
Dielectrics; Electromagnetic Measurement; Nondestructive Tests; External Tanks; Imaging Techniques; Thermal Protection; Microstructure

20080015624 Commonwealth Scientific and Industrial Research Organization, Linfield, Australia
Heath Monitoring of Thermal Protection Systems - Preliminary Measurements and Design Specifications
Scott, D. A.; Price, D. C.; December 2007; 91 pp.; In English; CD-ROM contains full text document in Microsoft Word format
Contract(s)/Grant(s): NNL07AA04P; 939904.05.07
Report No.(s): NASA/CR-2007-215092; CIP 2687; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015624

The work reported here is the first stage of a project that aims to develop a health monitoring system for Thermal Protection Systems (TPS) that enables a vehicle to safely re-enter the Earth's atmosphere. The TPS health monitoring system

is to be integrated into an existing acoustic emissions-based Concept Demonstrator, developed by CSIRO, which has been previously demonstrated for evaluating impact damage of aerospace systems.
Author
Thermal Protection; Nondestructive Tests; Design Analysis; Aerospace Systems; Acoustic Emission; Proving

39
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*.

20080014262 NASA Langley Research Center, Hampton, VA, USA
Snap-Through of Unsymmetric Laminates Using Piezocomposite Actuators
Schultz, Marc R.; Hyer, Michael W.; Williams, R. Brett; Wilkie, W. Keats; Inman, Daniel J.; Composites Science and Technology; [2006]; Volume 66, No. 14, pp. 2442-2448; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-064-20-22; Copyright; Avail.: CASI: A03, Hardcopy

The paper discusses the concept of using a piezoceramic actuator bonded to one side of a two-layer unsymmetric cross-ply [0/90]T laminate to provide the moments necessary to snap the laminate from one stable equilibrium shape to another. This concept could be applied to the morphing of structures. A model of this concept, which is based on the Rayleigh-Ritz technique and the use of energy and variational methods, is developed. The experimental phase of the study is discussed, including the measurement of the voltage level needed to snap the laminate. The voltage measurements and shapes are compared with predictions of the models and the agreement between measurements and the predictions are reasonable, both qualitatively and quantitatively. Suggestions for future activities are presented.
Author
Laminates; Broken Symmetry; Piezoelectric Actuators; Composite Structures; Piezoelectric Ceramics; Structural Stability; Shapes

20080014298 NASA Langley Research Center, Hampton, VA, USA
Nonlinear Reduced Order Random Response Analysis of Structures with Shallow Curvature
Przekop, Adam; Rizzi, Stephen A.; AIAA Journal; [2006]; Volume 44, No. 8, pp. 1767-1778; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-781-20-11; Copyright; Avail.: CASI: A03, Hardcopy

The goal of this investigation is to further develop nonlinear modal numerical simulation methods for application to geometrically nonlinear response of structures with shallow curvature under random loadings. For reduced order analysis, the modal basis selection must be capable of reflecting the coupling in both the linear and nonlinear stiffness. For the symmetric shallow arch under consideration, four categories of modal basis functions are defined. Those having symmetric transverse displacements (ST modes) can be designated as transverse dominated (ST-T) modes and in-plane dominated (ST-I) modes. Those having anti-symmetric transverse displacements (AT modes) can similarly be designated as transverse dominated (AT-T) modes and in-plane dominated (AT-I) modes. The response of an aluminum arch under a uniformly distributed transverse random loading is investigated. Results from nonlinear modal simulations made using various modal bases are compared with those obtained from a numerical simulation in physical degrees-of-freedom. While inclusion of ST-T modes is important for all response regimes, it is found that the ST-I modes become increasingly important in the nonlinear response regime, and that AT-T and AT-I modes are critical in the autoparametric regime.
Author
Degrees of Freedom; Structural Analysis; Simulation; Loads (Forces); Displacement; Nonlinearity

20080015658 NASA Langley Research Center, Hampton, VA, USA
Static and Dynamic Structural Response of an Aircraft Wing with Damage Using Equivalent Plate Analysis
Krishnamurthy, T.; Tsai, Frank J.; April 07, 2008; 18 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations
Report No.(s): AIAA Paper 2008-1967; Copyright; Avail.: CASI: A03, Hardcopy

A process to generate an equivalent plate based on an optimization approach to predict the static and dynamic response

of flight vehicle wing structures is proposed. Geometric-scale and frequency-scale factors are defined to construct an equivalent plate with any desired scale to use in simulation and wind tunnel experiments. It is shown that the stiffness and the displacements are scaled linearly with the geometric-scale factor, whereas the load is scaled as the square of the geometric-scale factor. The scaled stiffness of the reference flight vehicle is matched first to construct the equivalent plate. Then the frequency-scale factor is defined to scale the flight vehicle frequencies. The scaled flight vehicle frequencies are matched by placing arbitrary point masses along the equivalent plate geometry. Two simple stiffened-plate examples, one with damage and another without damage, were used to demonstrate the accuracy of the optimization procedure proposed. Geometric-scale factors ranging from 0.2 to 1.0 were used in the analyses. In both examples, the static and dynamic response of the reference stiffened-panel solution is matched accurately. The scaled equivalent plate predicted the first five frequencies of the stiffened panel very accurately. Finally, the proposed equivalent plate procedure was demonstrated in a more realistic typical aircraft wing structure. Two scale equivalent plate models were generated using the geometric-scale factors 1.0 and 0.2. Both equivalent plate models predicted the static response of the wing structure accurately. The equivalent plate models reproduced the first five frequencies of the wing structure accurately.
Author

Aircraft Structures; Wings; Structural Analysis; Dynamic Response; Structural Reliability; Plates (Structural Members); Aerospace Engineering; Design Optimization; Aircraft Design; Wing Panels

20080015659 General Dynamics Advanced Information Systems, Chantilly, VA, USA; NASA Langley Research Center, Hampton, VA, USA

Simulating the Structural Response of a Preloaded Bolted Joint

Knight, Norman F., Jr.; Phillips, Dawn R.; Raju, Ivatury S.; April 07, 2008; 20 pp.; In English; 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The present paper describes the structural analyses performed on a preloaded bolted-joint configuration. The joint modeled was comprised of two L-shaped structures connected together using a single bolt. Each L-shaped structure involved a vertical flat segment (or shell wall) welded to a horizontal segment (or flange). Parametric studies were performed using elasto-plastic, large-deformation nonlinear finite element analyses to determine the influence of several factors on the bolted-joint response. The factors considered included bolt preload, washer-surface-bearing size, edge boundary conditions, joint segment length, and loading history. Joint response is reported in terms of displacements, gap opening, and surface strains. Most of the factors studied were determined to have minimal effect on the bolted-joint response; however, the washer-bearing-surface size affected the response significantly.
Author

Bolted Joints; Structural Analysis; Finite Element Method; Load Carrying Capacity; Structural Strain; Structural Engineering

42
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*.

20080014310 NASA Johnson Space Center, Houston, TX, USA

Investigation of Synthetic Mg(1.3)V(1.7)O4 Spinel with MgO Inclusions: Case Study of a Spinel with an Apparently occupied Interstitial Site

Uchida, Hinako; Righter, Kevin; Lavina, Barbara; Nowell, Matthew M.; Wright, Stuart I.; Downs, Robert T.; Yang, Hexiong; [2007]; 7 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

A magnesium vanadate spinel crystal, ideally MgV2O4, synthesized at 1 bar, 1200 C and equilibrated under FMQ + 1.3 log f(sub o2) condition, was investigated using single-crystal X-ray diffraction, electron microprobe, and electron backscatter (EBSD). The initial X-ray structure refinements gave tetrahedral and octahedral site occupancies, along with the presence of 0.053 apfu Mg at an interstitial octahedral site . Back-scattered electron (BSE) images and electron microprobe analyses revealed the existence of an Mg-rich phase in the spinel matrix, which was too small (less than or equal to 3microns) for an accurate chemical determination. The EBSD analysis combined with X-ray energy dispersive spectroscop[y (XEDS) suggested that the Mg-rich inclusions are periclase oriented coherently with the spinel matrix. The final structure refinements were optimized by subtracting the X-ray intensity contributions (approx. 9%) of periclase reflections, which eliminated the

interstitial Mg. This study provides insight into possible origins of refined interstitial cations reported in the the literature for spinel, and points to the difficulty of using only X-ray diffraction data to distinguish a spinel with interstitial cations from one with coherently oriented MgO inclusions.
Author
Magnesium Oxides; Electron Probes; X Ray Diffraction; Tetrahedrons; Backscattering; Chemical Analysis; Vanadates; Spinel; Single Crystals

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*.

20080014273 NASA Langley Research Center, Hampton, VA, USA
Inter-Comparison of ILAS-II Version 1.4 Aerosol Extinction Coefficient at 780 nm with SAGE II, SAGE III, and POAM III Aerosol Data
Saitoh, Naoko; Hayashida, S.; Sugita, T.; Nakajima, H.; Yokota, T.; Hayashi, M.; Shiraishi, K.; Kanzawa, H.; Ejiri, M. K.; Irie, H.; Tanaka, T.; Terao, Y.; Kobayashi, H.; Sasano, Y.; Bevilacqua, R.; Randall, C.; Thomason, L.; Taha, G.; Journal of Geophysical Research; [2006]; Volume 111, pp. 1-10; In English
Contract(s)/Grant(s): 23-621-60-01; Copyright; Avail.: CASI: A03, Hardcopy

The Improved Limb Atmospheric Spectrometer (ILAS) II on board the Advanced Earth Observing Satellite (ADEOS) II observed stratospheric aerosol in visible/near-infrared/infrared spectra over high latitudes in the Northern and Southern Hemispheres. Observations were taken intermittently from January to March, and continuously from April through October, 2003. We assessed the data quality of ILAS-II version 1.4 aerosol extinction coefficients at 780 nm from comparisons with the Stratospheric Aerosol and Gas Experiment (SAGE) II, SAGE III, and the Polar Ozone and Aerosol Measurement (POAM) III aerosol data. At heights below 20 km in the Northern Hemisphere, aerosol extinction coefficients from ILAS-II agreed with those from SAGE II and SAGE III within 10%, and with those from POAM III within 15%. From 20 to 26 km, ILAS-II aerosol extinction coefficients were smaller than extinction coefficients from the other sensors; differences between ILAS-II and SAGE II ranged from 10% at 20 km to 34% at 26 km. ILAS-II aerosol extinction coefficients from 20 to 25 km in February over the Southern Hemisphere had a negative bias (12-66%) relative to SAGE II aerosol data. The bias increased with increasing altitude. Comparisons between ILAS-II and POAM III aerosol extinction coefficients from January to May in the Southern Hemisphere (defined as the non-Polar Stratospheric Cloud (PSC) season) yielded qualitatively similar results. From June to October (defined as the PSC season), aerosol extinction coefficients from ILAS-II were smaller than those from POAM III above 17 km, as in the case of the non-PSC season; however, ILAS-II and POAM III aerosol data were within 15% of each other from 12 to 17 km.
Author
Aerosols; Earth Observations (From Space); Spectrometers; Stratosphere; Polar Regions; Clouds; Polar Meteorology; Ozone Depletion; Atmospheric Chemistry

20080014304 NASA Langley Research Center, Hampton, VA, USA
Infrared Detector Activities at NASA Langley Research Center
Abedin, M. N.; Refaat, T. F.; Sulima, O. V.; Amzajerdian, F.; March 24, 2008; 7 pp.; In English; Material Research Society (MRS) 2008 Spring Meeting, 24-28 Mar. 2008, San Francisco,CA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 699152.04.05.05.04; Copyright; Avail.: CASI: A02, Hardcopy

Infrared detector development and characterization at NASA Langley Research Center will be reviewed. These detectors were intended for ground, airborne, and space borne remote sensing applications. Discussion will be focused on recently developed single-element infrared detector and future development of near-infrared focal plane arrays (FPA). The FPA will be applied to next generation space-based instruments. These activities are based on phototransistor and avalanche photodiode technologies, which offer high internal gain and relatively low noise-equivalent-power. These novel devices will improve the sensitivity of active remote sensing instruments while eliminating the need for a high power laser transmitter.
Author
Infrared Detectors; Remote Sensing; Earth Sciences; Satellite-Borne Instruments; Phototransistors

20080014319 NASA Langley Research Center, Hampton, VA, USA

Compact, Engineered, 2-Micron Coherent Doppler Wind Lidar Prototype for Field and Airborne Validation: Doppler Aerosol WiNd Lidar (DAWN). Interim Review #1 (6 months)

Kavaya, Michael J.; Singh, Upendra N.; Koch, Grady J.; Yu, Jirong; Amzajerdian, Farzin; Trieu, Bo C.; Petros, Mulugeta; June 23, 2006; 74 pp.; In English; 23rd International Laser Radar Conference (ILRC23), 24-28 Jul. 2006, Nara, Japan; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 478643.02.05.04.05

Report No.(s): IIP-04-0072; Interim Review #1; Copyright; Avail.: CASI: A04, Hardcopy

A new project, selected in 2005 by NASA's Science Mission Directorate (SMD), under the Instrument Incubator Program (IIP), will be described. The 3-year effort is intended to design, fabricate, and demonstrate a packaged, rugged, compact, space-qualifiable coherent Doppler wind lidar (DWL) transceiver capable of future validation in an aircraft and/or Unmanned Aerial Vehicle (UAV). The state-of-the-art 2-micron coherent DWL breadboard at NASA/LaRC will be engineered and compactly packaged consistent with future aircraft flights. The packaged transceiver will be integrated into a coherent DWL system test bed at LaRC. Atmospheric wind measurements will be made to validate the packaged technology. This will greatly advance the coherent part of the hybrid DWL solution to the need for global tropospheric wind measurements.

Author (revised)

Doppler Radar; Aerosols; Optical Radar; Transmitter Receivers; Wind (Meteorology); Wind Measurement; Data Acquisition; Airborne Radar; Remote Sensing

20080014442 Naval Postgraduate School, Monterey, CA USA

From Oil Wells to Institution Building: An Approach for Fair Oil Distribution in Iraq

Coskun, Eyup; Dec 2007; 105 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475827; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475827

This thesis analyzes the current problems surrounding the distribution of oil revenues in Iraq. First, the main problems facing Iraq's oil economy are examined. Second, an assessment is made of the distribution system outlined in the Iraqi constitution. Third, based on this assessment, arguments are made as to the necessity of a new oil law. A critical area of discussion centers on the issue of federalism versus a strong central government. Which system best serves the needs of the country in a manner consistent with future stability? The thesis also examines the feasibility of a direct distribution system for oil revenues. Here the main issues center on the feasibility of alternative distribution systems and the opposition they may face. The thesis concludes by proposing a framework for an ideal distribution system, possible modifications to the Iraqi Constitution, and a new Iraqi Hydrocarbon/Oil Law. The author recommends eight steps to help achieve a solution. The study draws on the knowledge of many scholars and country officials as well as the author's personal observations and thoughts that were gained while he served in Iraq in various missions. It is hoped that the study will assist in resolving some of the tension and violence that are occurring in an area where multiple ethnic and sectarian groups are vying for a single strategic resource. DTIC

Crude Oil; Income; Iraq; Law (Jurisprudence); Oils; Policies; Revenue; Wells

20080014467 Naval Postgraduate School, Monterey, CA USA

Over a Barrel: Where Russian Energy Policy Leaves Europe with Regards to Its Energy Security

Roettger, Glenn D; Dec 2007; 101 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475887; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475887

Within the last few years, Europe has witnessed several major disruptions in its supply of Russian energy. The recent 'gas wars' between Russia and Ukraine in early 2006, as well as the disruption of gas transiting Belarus in January 2007, posed serious implications for an already energy-deprived Europe. Russia's aging infrastructure, infamously inefficient domestic consumption, and current state of affairs, raises considerable doubts over its ability to supply consistent levels of energy to downstream markets. Consequently, can Europe truly depend upon Russia to supply energy when and where they promise? Despite President Vladimir Putin's claims to the contrary, Moscow uses energy as an instrument of national power, to influence, dictate, and enforce its foreign policy with regard to the rest of the world. Russia's vast untapped resources are huge, and if harvested correctly could help to provide stability in a world that is starving for energy. Yet, Russia's actions seem to indicate that it is not willing to permit market forces to dictate what it can supply or even when and to whom it will supply

energy. Nevertheless, energy security is and will continue to be a primary factor in relationships among Europe, Russia, and the rest of the world.
DTIC
Crude Oil; Energy Policy; Europe; Natural Gas; Policies; Russian Federation; Security; Supplying

20080014535 Naval Postgraduate School, Monterey, CA USA
Implications of China's Growing Demand for Oil: A Case Study in Venezuela
Peterson, Keith A; Dec 2007; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476048; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476048

China's economic rise has been coupled with a growing need to find reliable foreign energy sources. China is the world's second largest oil consumer. China's demand for oil is outpacing previous estimates and accounted for 38 percent of the world's increased demand in 2006. Venezuela is the sixth largest oil producer and is now providing oil to China as a way to diversify exports away from the USA. As China's demand increases and global oil production wanes, China will become major a competitor for oil supplies against the USA. To compete for oil China will need strategic allies, and it has found a willing partner in Venezuela. The solution to the looming problem of increasing oil demand and decreasing supplies is a new approach to international oil markets that removes politics from the sale of oil. A multilateral effort led by Japan has the greatest likelihood of success in a world that is becoming increasingly competitive over resources. Creating a framework that promotes cooperation before supply becomes limited is very important for success. If the three largest importers -- the USA, Japan, and China -- all work together, the likelihood of future war or severe economic shock over oil competition among the great powers will be diminished.
DTIC
China; Competition; Crude Oil; Oils; United States; Venezuela

20080014663 Library of Congress, Washington, DC USA
Caspian Oil and Gas: Production and Prospects
Gelb, Bernard A; Mar 4, 2005; 7 pp.; In English
Report No.(s): AD-A476137; CRS-RS21190; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Caspian Sea is a 700-mile-long body of water in central Asia bordered by Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan. Among the five nations, only Iran is a member of the Organization of Petroleum Exporting Countries (OPEC). Azerbaijan, Kazakhstan, and Turkmenistan became independent when the Soviet Union dissolved in 1991. The Caspian Sea region historically has been an oil and natural gas producer, but many believe that the region contains large reserves of oil and gas capable of much greater production than at present. Because diversity of energy sources is a consideration in Congressional deliberations on energy policy, this prospect could play a role in such discussions. However, there are notable obstacles to increases in Caspian Sea region production of oil and gas that may slow development. This report will be updated as events warrant.
DTIC
Caspian Sea; Crude Oil; Natural Gas; Oils

20080014808 NASA Johnson Space Center, Houston, TX, USA
The Urban Environmental Modeling (UEM) Project 100 Cities: The legacy of the First Phase and Next Steps
Wentz, Elizabeth A.; Stefanov, William L.; Moeller, Matthias; Netzband, Maik; Brazel, Anthony; [2008]; 33 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

The Urban Environmental Monitoring (UEM) project, also known as the 100 Cities Project (http://hundredcities.asu.edu/index.html), at Arizona State University (ASU) is a baseline effort to collect and analyze remotely sensed data for 100 urban centers worldwide. Our overarching goal is to use remote sensing technology to better understand the consequences of rapid urbanization through advanced biophysical measurements, classification methods, and modeling, which can then be used to inform public policy and planning. Urbanization represents one of the most significant alterations that humankind has made to the surface of the earth. In the early 20th Century, there were less than twenty cities in the world with populations over one million; today there are over four hundred. The consequences of urbanization include the transformation of land surfaces from undisturbed natural environments to land that supports different forms of human activity, including agriculture, residential, commercial, industrial, and infrastructure such as roads and other types of transportation. Each of these land transformations has impacted, to varying degrees, the local climatology, hydrology, and biota that predate human settlement. It is essential that

we document, to the best of our ability, the nature of land transformations and the consequences to the existing environment. The focus in the UEM project since its inception has been on rapid urbanization. Rapid urbanization is occurring in hundreds of cities worldwide as population increases and people migrate from rural communities to urban centers in search of employment and a better quality of life. The unintended consequences of rapid urbanization have the potential to cause serious harm to the environment, to human life, and to the resulting built environment because rapid development constrains and rushes decision-making. Such rapid decision-making can result in poor planning, policies, and decisions that harm the environment and the quality of human life. Slower, more thought-out decision-making could have resulting in more favorable outcomes. The harm to the environment includes poor air quality, soil erosion, polluted rivers and aquifers, and loss of wildlife habitat. Human life is then threatened because of increased potential for disease spreading, human conflict, and diminished quality of life. The built environment is potentially threatened when cities are built in areas that can be impacted by events such as hurricanes, tsunamis, earthquakes, fires, and landslides. Our goals include assessing the threat of such events on cities and the people living there.
Author
Cities; Environment Models; Environmental Monitoring; Earthquakes; Remote Sensing; Biophysics

20080014821 NASA Langley Research Center, Hampton, VA, USA
Status of Laser/Lidar Working Group Requirements
Kavaya, Michael J.; Gentry, Bruce M.; June 27, 2006; 36 pp.; In English; Working Group on Space-Based Lidar Winds, 27-30 Jun. 2006, Welches, OR, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 478643.02.02.02.08; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014821
This viewgraph presentation reviews the status of the development of the requirements by the Laser/Lidar working group. Included in the presentation is another viewgraph report on the NASA Earth Science Technology Office (ESTO) Laser/Lidar working group, by the chairperson of the working group. Some of the uses of Laser and Lidar in earth sciences are reviewed and a roadmap for the future use of the technology is included.
CASI
Lasers; Optical Radar; Earth Sciences

20080014856 NASA Langley Research Center, Hampton, VA, USA
Re-Examination of the Observed Decadal Variability of Earth Radiation Budget Using Altitude-Corrected ERBE/ERBS Nonscanner WFOV Data
Wong, Takmeng; Wielicki, Bruce A.; Lee, Robert B.; Smith, G. Louis; Bush, Kathryn A.; January 2005; 31 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-621-30-96; Copyright; Avail.: CASI: A03, Hardcopy
This paper gives an update on the observed decadal variability of Earth Radiation Budget using the latest altitude-corrected Earth Radiation Budget Experiment (ERBE)/Earth Radiation Budget Satellite (ERBS) Nonscanner Wide Field of View (WFOV) instrument Edition3 dataset. The effects of the altitude correction are to modify the original reported decadal changes in tropical mean (20N to 20S) longwave (LW), shortwave (SW), and net radiation between the 1980s and the 1990s from 3.1/-2.4/-0.7 to 1.6/-3.0/1.4 Wm(sup -2) respectively. In addition, a small SW instrument drift over the 15-year period was discovered during the validation of the WFOV Edition3 dataset. A correction was developed and applied to the Edition3 dataset at the data user level to produce the WFOV Edition3_Rev1 dataset. With this final correction, the ERBS Nonscanner observed decadal changes in tropical mean LW, SW, and net radiation between the 1980s and the 1990s now stand at 0.7/-2.1/1.4 Wm(sup -2), respectively, which are similar to the observed decadal changes in the HIRS Pathfinder OLR and the ISCCP FD record; but disagree with the AVHRR Pathfinder ERB record. Furthermore, the observed interannual variability of near-global ERBS WFOV Edition3_Rev1 net radiation is found to be remarkably consistent with the latest ocean heat storage record for the overlapping time period of 1993 to 1999. Both data sets show variations of roughly 1.5 Wm(sup -2) in planetary net heat balance during the 1990s.
Author
Earth Radiation Budget Experiment; Field of View; Periodic Variations; Remote Sensing; Clouds (Meteorology)

20080014859 NASA Langley Research Center, Hampton, VA, USA

First Light from the Far-Infrared Spectroscopy of the Troposphere (FIRST) Instrument

Mlynczak, Martin G.; Johnson, David G.; Latvakoski, Harri; Jucks, Kenneth; Watson, Mike; Bingham, Gail; Kratz, David P.; Traub, Wesley A.; Wellard, Stanley J.; Hyde, Charles R.; Liu, Xu; January 2005; 12 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 23-258-80-32; Copyright; Avail.: CASI: A03, Hardcopy

We present first light spectra from the new Far-Infrared Spectroscopy of the Troposphere (FIRST) instrument. FIRST is a Fourier Transform Spectrometer developed to measure accurately the far-infrared (15 to 100 micrometers; 650 to 100 wavenumbers) emission spectrum of the Earth and its atmosphere. The observations presented here were obtained during a high altitude balloon flight from Ft. Sumner, New Mexico on 7 June 2005. The flight data demonstrate the instrument's ability to observe the entire energetically significant infrared emission spectrum (50 to 2000 wavenumbers) at high spectral and spatial resolution on a single focal plane in an instrument with one broad spectral bandpass beamsplitter. Comparisons with radiative transfer calculations demonstrate that FIRST accurately observes the very fine spectral structure in the far-infrared. Comparisons of the atmospheric window radiances measured by FIRST and by instruments on the NASA Aqua satellite that overflew FIRST are in excellent agreement. FIRST opens a new window on the spectrum that can be used for studying atmospheric radiation and climate, cirrus clouds, and water vapor in the upper troposphere.

Author

Infrared Spectra; Troposphere; Far Infrared Radiation; MODIS (Radiometry); Emission Spectra; Infrared Spectroscopy

20080014870 NASA Stennis Space Center, Stennis Space Center, MS, USA

2005 AG20/20 Annual Review

Ross, Kenton W.; McKellip, Rodney D.; April 11, 2005; In English; NASA Ag20/20 USDA IFAFS 2005 Annual Review, 11 Apr. 2005, New Orleans, LA, USA; See also 20080014871 - 20080014887

Contract(s)/Grant(s): NNS04AB54T

Report No.(s): SSTI-2220-0094; Copyright; Avail.: CASI: C01, CD-ROM

Topics covered include: Implementation and Validation of Sensor-Based Site-Specific Crop Management; Enhanced Management of Agricultural Perennial Systems (EMAPS) Using GIS and Remote Sensing; Validation and Application of Geospatial Information for Early Identification of Stress in Wheat; Adapting and Validating Precision Technologies for Cotton Production in the Mid-Southern USA - 2004 Progress Report; Development of a System to Automatically Geo-Rectify Images; Economics of Precision Agriculture Technologies in Cotton Production-AG 2020 Prescription Farming Automation Algorithms; Field Testing a Sensor-Based Applicator for Nitrogen and Phosphorus Application; Early Detection of Citrus Diseases Using Machine Vision and DGPS; Remote Sensing of Citrus Tree Stress Levels and Factors; Spectral-based Nitrogen Sensing for Citrus; Characterization of Tree Canopies; In-field Sensing of Shallow Water Tables and Hydromorphic Soils with an Electromagnetic Induction Profiler; Maintaining the Competitiveness of Tree Fruit Production Through Precision Agriculture; Modeling and Visualizing Terrain and Remote Sensing Data for Research and Education in Precision Agriculture; Thematic Soil Mapping and Crop-Based Strategies for Site-Specific Management; and Crop-Based Strategies for Site-Specific Management.

Derived from text

Agriculture; Soil Mapping; Farm Crops; Canopies (Vegetation); Thematic Mapping; Remote Sensing; Field Tests

20080014871 Missouri Univ., Columbia, MO, USA; USA Department of Agriculture Forest Service, USA; Illinois Univ., Urbana-Champaign, IL, USA

Implementation and Validation of Sensor-Based Site-Specific Crop Management

Palm, Harlan; 2005 AG20/20 Annual Review; April 11, 2005; 37 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation reviews the use of an sensor based system for crop management at specific sites. It includes the type of field data that was gathered: Historical Aerial Photos, Remotely Sensed Aerial imagery, soil electrical conductivity map, digitized elevation map, soil fertility maps and yield maps. There is discussion about the review of the field data. The two types of sensors (Light emitting diodes in two types of sensors that cast visible orange or green light and the sensors also measure respective reflectance values) are shown. The use of the sensor data is reviewed.

CASI

Farm Crops; Remote Sensing; Soil Mapping; Crop Growth; Agriculture; Multisensor Applications

20080014872 Louisiana Univ., Monroe, LA, USA
Prescription Farming Automation Algorithms
Magoun, Dale; Smith, Lon; Cordova, Jose; Kammerdiener, Troy; 2005 AG20/20 Annual Review; April 11, 2005; 12 pp.; In English; See also 20080014870; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A viewgraph presentation on the use of automation algorithms for prescription farming files is shown. The topics include: 1) Using NavView to Create Prescription Files; 2) Using Registered Bitmap Files to Overlay N01 Files in NavView; 3) Solutions to On-Off Applications; 4) Steps to Providing Solutions; 5) File Open Menu; 6) Full Screen View of Imported Shape File; 7) Cleanup Menu Item; 8) Exclude Menu Item; 9) Results of using right mouse button to un-exclude areas from previous slide; 10) AgNav View of N01 and XCL Files Generated by Farm Tools; and 11) Problems to be Solved.
CASI
Algorithms; Agriculture; Automation; Computer Programs

20080014873 Florida Univ., Lake Alfred, FL, USA
Characterization of Tree Canopies
Salyani, Masoud; 2005 AG20/20 Annual Review; April 11, 2005; 6 pp.; In English; See also 20080014870; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Tree canopy profiles are scanned and photos are shown of the laser system in operation. A false color image of a tree obtained with a lase scanner is shown along with a pseudo-color image of one row. A real-time run scan at 1mph is also shown.
Derived from text
Canopies (Vegetation); Trees (Plants); Real Time Operation; Lasers

20080014874 Florida Univ., Lake Alfred, FL, USA
In-Field Sensing of Shallow Water Tables and Hydromorphic Soils with an Electromagnetic Induction Profiler
Schumann, Arnold; Schumann, Arnold; 2005 AG20/20 Annual Review; April 11, 2005; 6 pp.; In English; See also 20080014870; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

1 The higher EC values (mean EM values 6.34 and 4.68 mS/m) were found in the Myakka and Placid fine sands, respectively. 2. EC values were grouped by soil series and mapped for the grove and different soil series had distinctly different EC values. 3. The results indicate that electromagnetic induction instruments could be useful to delineate different soil series within a grove. 4. These EC maps could be used to develop management zones on different soil type basis for the variable rate application of agrochemicals.
Derived from text
Magnetic Induction; Water Tables; Soils; Sands; Detection

20080014875 Washington State Univ., USA
Maintaining the Competitiveness of Tree Fruit Production Through Precision Agriculture
Perry, Eileen; Pierce, Fran; Davenport, Joan; Stevens, Robert; Seavert, Clark; Schutlhess, Urs; 2005 AG20/20 Annual Review; April 11, 2005; 13 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A viewgraph presentation on the precision agriculture that yields fresh tree fruit is shown. The Normalized Division Vegetation Index (NDVI), chlorophyll index and canopy density from apple trees is also presented.
CASI
Agriculture; Fruits; Trees (Plants); Remote Sensing; Thematic Mapping

20080014876 Oklahoma State Univ., Stillwater, OK, USA
Field Testing a Sensor-Based Applicator for Nitrogen and Phosphorus Application
Solie, John B.; 2005 AG20/20 Annual Review; April 11, 2005; 41 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes the field tests performed on the GreenSeeker (TM) N-Fertilizer sensor applicator

for Nitrogen and Phosphorus applications. The results of wheat and corn growth using this fertilizer, along aerial and satellite imagery is also shown.
CASI
Fertilizers; Field Tests; Nitrogen; Phosphorus; Crop Growth; Optimization; Satellite Imagery

20080014877 Florida Univ., Gainesville, FL, USA
Early Detection of Citrus Diseases Using Machine Vision and DGPS
Burks, Thomas F.; 2005 AG20/20 Annual Review; April 11, 2005; 9 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Color co-occurence texture analysis has been identified as a viable feature extraction approach for classifying citrus disease in controlled lighting conditions. The Mahalanobis distance classifier, and back-propagation neural network have been identified as robust classifiers that could operate in real time control applications.
Derived from text
Citrus Trees; Detection; Diseases; Computer Vision; Leaves; Global Positioning System

20080014878 Florida Univ., Gainesville, FL, USA
Spectral-based Nitrogen Sensing for Citrus
Lee, Daniel; 2005 AG20/20 Annual Review; April 11, 2005; 6 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Water effect normilization: Convert dry basis N(sub d)(%) to wet basis N(sub f) (%). N(sub d) = dry basis N (%) of a dried leaf sample, N(sub f) = wet basis N (%) of a fresh leaf sample, W(sub d) = Weight of a dried leaf sample (g), and W(sub f) = Weight of a fresh leaf sample (g). Water effect: Dry vs. Wet: Wet basis data set yielded better results. Water had strong effect for nitrogen detection.
Derived from text
Detection; Nitrogen; Water; Citrus Trees; Drying

20080014879 Utah State Univ., Logan, UT, USA
2005 Report: AG20/20--IFAFS Project, Utah State University
2005 AG20/20 Annual Review; April 11, 2005; 45 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Objectives: a) Use Aerial and Satellite images to identify nitrogen stress in wheat. b) Observe wheat protein response to additional nitrogen applied at antithesis. Goals: a) Cooperate with NAWG (and allied industries) to research/demonstrate the benefits of Geospatial Nitrogen Management Technologies(GNMT). b) Use the 'Tailgate Network' ('benchmark' County Agents and 'benchmark' farmers/ranchers) to enhance the dissemination and adoption of profitable GNMT's and other technologies.
Derived from text
Wheat; Proteins; Satellite Imagery; Nitrogen; Remote Sensing; Carbon

20080014880 Rutgers - The State Univ., New Brunswick, NJ, USA
Enhanced Management of Agricultural via Remote Sensing and GIS
Oudemans, Peter V.; 2005 AG20/20 Annual Review; April 11, 2005; 59 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Objectives: a) To develop a series of crop stress detection methods and crop yield models using remote sensing inputs. b) Verify crop loss and identify environmental factors, contributing to the loss through ground based data collection. c) Test specific treatments to determine economic impacts. d) Integrate the crop loss maps with ground based scouting for fast delivery of treatment maps and technology adoption.
Derived from text
Agriculture; Farm Crops; Remote Sensing; Data Acquisition; Management Systems; Losses

20080014881 Louisiana State Univ., Baton Rouge, LA, USA
Development of a System to Automatically Geo-Rectify Images
Price, Randy R.; 2005 AG20/20 Annual Review; April 11, 2005; 17 pp.; In English; See also 20080014870; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Objective: Develop a low cost system that will allow consultants to easily integrate NDVI images into a site specific

farming package for prescription map generation. In louisiana, spray plane operators and consultants are wanting a system that can quickly generate a prescription map for NDVI images. This system would be used to allow quick turn around times in prescription map generation and spraying. System was constructed to geo-rectify/ register images. Spatial accuracies were 30 ft. using WAAS GPS with PPS (pulse per second) capabilities and a camera aligned to the flight horizon of the aircraft (when flying at altitudes less than 1600ft.) Processing times were less than 1 minute per image.
Derived from text
Global Positioning System; Normalized Difference Vegetation Index; Sprayers; Low Cost; Spraying

20080014882 Florida Univ., Gainesville, FL, USA
Remote Sensing of Citrus Tree Stress Levels and Factors
Jordan, Jonathan D.; 2005 AG20/20 Annual Review; April 11, 2005; 4 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes remote sensing of citrus tree stress levels and the suppression of pest effects using various biological and chemical controls.
CASI
Citrus Trees; Remote Sensing; Pesticides; Photosynthesis

20080014883 Louisiana State Univ., Baton Rouge, LA, USA
Adapting and Validating Precision Technologies for Cotton Production in the Mid-Southern USA: 2004 Progress Report
Leonard, Roger; 2005 AG20/20 Annual Review; April 11, 2005; 9 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Objectives: a) Compare efficacy/value of SVP to broadcast pesticide app. b) Technology improvements. c) Develop/ implement demonstration/education programs (producers, Ag consultants, applications extension and research personnel). Summary: a) Relationship of insects to NDVI-based images - transient. b) Yield based Rx for IPM - promising. c) NDVI-based Rx for cotton PGR/harvest aids - successful. d) NDVI-Rx for grain IPM - improving. e) Geo-referenced sampling - becoming accepted. For 2005, complete on-going research, expand demonstrations, improve technologies, and promote technology transfer.
Derived from text
Cotton; Normalized Difference Vegetation Index; Pesticides; Technology Transfer; Education

20080014884 Louisiana State Univ., Baton Rouge, LA, USA
Economics of Precision Agriculture Technologies in Cotton Production-AG 2020
Paxton, Kenneth W.; 2005 AG20/20 Annual Review; April 11, 2005; 13 pp.; In English; See also 20080014870; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes the economics and precision agriculture technologies involved in cotton production.
CASI
Agriculture; Cotton; Economics; Precision

20080014885 Montana State Univ., Bozeman, MT, USA
Modeling and Visualizing Terrain and Remote Sensing Data for Research and Education in Precision Agriculture
Long, Daniel S.; 2005 AG20/20 Annual Review; April 11, 2005; 61 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This viewgraph presentation describes three dimensional models, terrain visualization, and remote sensing data acquisition for use in precision agriculture.
CASI
Agriculture; Data Acquisition; Education; Remote Sensing; Terrain; Three Dimensional Models

20080014886 Nebraska Univ., Lincoln, NE, USA

Thematic Soil Mapping and Crop-Based Strategies for Site-Specific Management

Dobermann, Achim; Adamchuk, Viacheslav; Ping, Jianli; Ferguson, Richard; 2005 AG20/20 Annual Review; April 11, 2005; 21 pp.; In English; See also 20080014870; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Variable rate treatments were applied in 2003 and 2004 and produced relatively small differences in yield or economic return among the primary treatments. There were significant differences in yield, economic returns, and fertilizer inputs among yield goal classes in most site-years. Substantial improvements in nutrient use efficiency may require combining soil-based thematic map approaches with in-season sensing of crop canopy N status. Soil resistance maps may reflect field history areas for improved management. On-the-go pH mapping is potentially beneficial, particularly if combined with estimates of buffer capacity to guide variable rate timing. Integration of sensors based on different measurement principles for different parameters is a likely next step.

Derived from text

Soil Mapping; Thematic Mapping; Farm Crops; Fertilizers; Detection; Canopies (Vegetation)

20080014887 Nebraska Univ., Lincoln, NE, USA

Crop-Based Strategies for Site-Specific Management: An Update

Shanahan, John; 2005 AG20/20 Annual Review; April 11, 2005; 31 pp.; In English; See also 20080014870; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Goals and Objectives: Develop algorithms for triggering N applications based on in-season canopy reflectance data. Demonstrate the ability of high-clearance applicator systems to be a practical means for farmers to reduce total N applications. Educate public and private sector professionals in the science and engineer9ing of crop-based strategies for in-season N management. Conclusion: Green > red for detecting N stress during window we propose to apply N. Spatial variation in N response across the landscape. Corn is responsive to late (V-14) application. Both crop reflectance and soil-derived data may be useful in predicting yield response to N. How to best identify N responsive areas in fields.

Derived from text

Farm Crops; Spatial Distribution; Corn; Detection; Algorithms; Soils; Terrain; Reflectance

20080015381 NASA Langley Research Center, Hampton, VA, USA

CEOS SEO and GISS Meeting

Killough, Brian; Stover, Shelley; March 21, 2008; 11 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Committee on Earth Observation Satellites (CEOS) provides a brief to the Goddard Institute for Space Studies (GISS) regarding the CEOS Systems Engineering Office (SEO) and current work on climate requirements and analysis. A 'system framework' is provided for the Global Earth Observation System of Systems (GEOSS). SEO climate-related tasks are outlined including the assessment of essential climate variable (ECV) parameters, use of the 'systems framework' to determine relevant informational products and science models and the performance of assessments and gap analyses of measurements and missions for each ECV. Climate requirements, including instruments and missions, measurements, knowledge and models, and decision makers, are also outlined. These requirements would establish traceability from instruments to products and services allowing for benefit evaluation of instruments and measurements. Additionally, traceable climate requirements would provide a better understanding of global climate models.

Author

Earth Observations (From Space); Climatology; Systems Engineering

20080015423 State Univ. of New York, Albany, NY, USA; NASA Langley Research Center, Hampton, VA, USA

Remote Sensing of Evapotranspiration and Carbon Uptake at Harvard Forest

Min, Qilong; Lin, Bing; January 2005; 19 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): DE-FC03-90ER61010; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015423

A land surface vegetation index, defined as the difference of microwave land surface emissivity at 19 and 37 GHz, was calculated for a heavily forested area in north central Massachusetts. The microwave emissivity difference vegetation index (EDVI) was estimated from satellite SSM/I measurements at the defined wavelengths and used to estimate land surface

turbulent fluxes. Narrowband visible and infrared measurements and broadband solar radiation observations were used in the EDVI retrievals and turbulent flux estimations. The EDVI values represent physical properties of crown vegetation such as vegetation water content of crown canopies. The collocated land surface turbulent and radiative fluxes were empirically linked together by the EDVI values. The EDVI values are statistically sensitive to evapotranspiration fractions (EF) with a correlation coefficient (R) greater than 0.79 under all-sky conditions. For clear skies, EDVI estimates exhibit a stronger relationship with EF than normalized difference vegetation index (NDVI). Furthermore, the products of EDVI and input energy (solar and photosynthetically-active radiation) are statistically significantly correlated to evapotranspiration (R=0.95) and CO2 uptake flux (R=0.74), respectively.
Author
Evapotranspiration; Forests; Remote Sensing; Carbon Dioxide; Vegetation; Earth Surface

20080015425 NASA Langley Research Center, Hampton, VA, USA
Principal Component-Based Radiative Transfer Model (PCRTM) for Hyperspectral Sensors, Part I, Theoretical Concept
Liu, Xu; Smith, William L.; Zhou, Daniel K.; Larar, Allen; January 2005; 28 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Modern infrared satellite sensors such as Atmospheric Infrared Sounder (AIRS), Cosmic Ray Isotope Spectrometer (CrIS), Thermal Emission Spectrometer (TES), Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS) and Infrared Atmospheric Sounding Interferometer (IASI) are capable of providing high spatial and spectral resolution infrared spectra. To fully exploit the vast amount of spectral information from these instruments, super fast radiative transfer models are needed. This paper presents a novel radiative transfer model based on principal component analysis. Instead of predicting channel radiance or transmittance spectra directly, the Principal Component-based Radiative Transfer Model (PCRTM) predicts the Principal Component (PC) scores of these quantities. This prediction ability leads to significant savings in computational time. The parameterization of the PCRTM model is derived from properties of PC scores and instrument line shape functions. The PCRTM is very accurate and flexible. Due to its high speed and compressed spectral information format, it has great potential for super fast one-dimensional physical retrievals and for Numerical Weather Prediction (NWP) large volume radiance data assimilation applications. The model has been successfully developed for the National Polar-orbiting Operational Environmental Satellite System Airborne Sounder Testbed - Interferometer (NAST-I) and AIRS instruments. The PCRTM model performs monochromatic radiative transfer calculations and is able to include multiple scattering calculations to account for clouds and aerosols.
Author (revised)
Principal Components Analysis; Radiative Transfer; Remote Sensing; Infrared Spectra; Sensors; Scientific Satellites; Environmental Monitoring; Weather Forecasting

20080015433 National Oceanic and Atmospheric Administration, Camp Springs, MD, USA; NASA Langley Research Center, Hampton, VA, USA
Consistency of Global Modis Aerosol Optical Depths over Ocean on Terra and Aqua Ceres SSF Datasets
Ignatov, Alexander; Minnis, Patrick; Miller, Walter F.; Wielicki, Bruce A.; Remer, Lorraine; [2006]; 51 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): L-90987C; Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://dx.doi.org/10.1029/2005JD006645

Aerosol retrievals over ocean from the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard Terra and Aqua platforms are available from the Clouds and the Earth's Radiant Energy System (CERES) Single Scanner Footprint (SSF) datasets generated at NASA Langley Research Center (LaRC). Two aerosol products are reported side-by-side. The primary M product is generated by sub-setting and remapping the multi-spectral (0.47-2.1 micrometer) MODIS produced oceanic aerosol (MOD04/MYD04 for Terra/Aqua) onto CERES footprints. M*D04 processing uses cloud screening and aerosol algorithms developed by the MODIS science team. The secondary AVHRR-like A product is generated in only two MODIS bands 1 and 6 (on Aqua, bands 1 and 7). The A processing uses the CERES cloud screening algorithm, and NOAA/NESDIS glint identification, and single-channel aerosol retrieval algorithms. The M and A products have been documented elsewhere and preliminarily compared using 2 weeks of global Terra CERES SSF Edition 1A data in which the M product was based on MOD04 collection 3. In this study, the comparisons between the M and A aerosol optical depths (AOD) in MODIS band 1 (0.64 micrometers), tau(sub 1M) and tau(sub 1A) are re-examined using 9 days of global CERES SSF Terra Edition 2A and Aqua Edition 1B data from 13 - 21 October 2002, and extended to include cross-platform comparisons. The M and A products on the new CERES SSF release are generated using the same aerosol algorithms as

before, but with different preprocessing and sampling procedures, lending themselves to a simple sensitivity check to non-aerosol factors. Both tau(sub 1M) and tau(sub 1A) generally compare well across platforms. However, the M product shows some differences, which increase with ambient cloud amount and towards the solar side of the orbit. Three types of comparisons conducted in this study - cross-platform, cross-product, and cross-release confirm the previously made observation that the major area for improvement in the current aerosol processing lies in a more formalized and standardized sampling (and most importantly, cloud screening) whereas optimization of the aerosol algorithm is deemed to be an important yet less critical element.
Author
Aerosols; MODIS (Radiometry); Oceans; Optical Thickness; Terra Spacecraft; Aqua Spacecraft

20080015434 Lanzhou Univ., China; NASA Langley Research Center, Hampton, VA, USA
The Effect of Asian Dust Aerosols on Cloud Properties and Radiative Forcing from MODIS and CERES
Huang, Jianping; Minnis, Patrick; Lin, Bing; Wang, Tianhe; Yi, Yuhong; Hu, Yongxiang; Sun-Mack, Sunny; Ayers, Kirk; [2005]; 18 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The effects of dust storms on cloud properties and radiative forcing are analyzed over northwestern China from April 2001 to June 2004 using data collected by the Moderate Resolution Imaging Spectroradiometer (MODIS) and Clouds and the Earth's Radiant Energy System (CERES) instruments on the Aqua and Terra satellites. On average, ice cloud effective particle diameter, optical depth and ice water path of the cirrus clouds under dust polluted conditions are 11%, 32.8%, and 42% less, respectively, than those derived from ice clouds in dust-free atmospheric environments. The humidity differences are larger in the dusty region than in the dust-free region, and may be caused by removal of moisture by wet dust precipitation. Due to changes in cloud microphysics, the instantaneous net radiative forcing is reduced from -71.2 W/m2 for dust contaminated clouds to -182.7 W/m2 for dust-free clouds. The reduced cooling effects of dusts may lead to a net warming of 1 W/m2, which, if confirmed, would be the strongest aerosol forcing during later winter and early spring dust storm seasons over the studied region.
Author
Aerosols; Asia; Cloud Physics; Dust Storms; MODIS (Radiometry); Imaging Spectrometers; Radiant Flux Density

20080015493 National Center for Atmospheric Research, Boulder, CO, USA; NASA Langley Research Center, Hampton, VA, USA
SABER Observations of the OH Meinel Airglow Variability Near the Mesopause
Marsh, Daniel R.; Smith, Anne K.; Mlynczak, Martin G.; [2005]; 35 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015493

The Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) instrument, one of four on board the TIMED satellite, observes the OH Meinel emission at 2.0 m that peaks near the mesopause. The emission results from reactions between members of the oxygen and hydrogen chemical families that can be significantly affected by mesopause dynamics. In this study we compare SABER measurements of OH Meinel emission rates and temperatures with predictions from a 3-dimensional chemical dynamical model. In general, the model is capable of reproducing both the observed diurnal and seasonal OH Meinel emission variability. The results indicate that the diurnal tide has a large effect on the overall magnitude and temporal variation of the emission in low latitudes. This tidal variability is so dominant that the seasonal cycle in the nighttime emission depends very strongly on the local time of the analysis. At higher latitudes, the emission has an annual cycle that is due mainly to transport of oxygen by the seasonally reversing mean circulation.
Author
Airglow; Broadband; Hydroxyl Emission; Mesopause; Radiometers; Atmospheric Sounding; Diurnal Variations

20080015495 Academia Sinica, Beijing, China
Comparison between the Temperature Measurements by TIMED/SABER and Lidar in the Mid-Latitude
Xu, Jiyao; She, C. Y.; Yuan, Wei; Mertens, Chris; Mlynczak, Marty; Russell, James; [2005]; 16 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-10076; NSF ATM-00-03171; 40225011; 40336054; G2000078407; KZCX3-SW-217; Copyright; Avail.: CASI: A03, Hardcopy

Comparisons of monthly-mean nighttime temperature profiles observed by the Sodium Lidar at Colorado State University

and TIMED/SABER over passes are made. In the altitude range from 85 km to about 100 km, the two observations are in excellent agreement. Though within each other s error bars, important differences occur below 85 km in the entire year and above 100 km in the summer season. Possible reasons for these difference are high photon noise below 85 km in lidar observations, and less than accurate assumptions in the concentration of important chemical species like oxygen (and its quenching rate) in the SABER retrieval above 100 km. However, the two techniques both show the two-level mesopause thermal structure, with the times of change from one level to the other in excellent agreement. Comparison indicates that the high-level (winter) mesopause altitudes are also in excellent agreement between the two observations, though some difference may exist in the low-level (summer) mesopause altitudes between ground-based and satellite-borne data.
Author
Optical Radar; Temperature Measurement; Temperate Regions; Remote Sensing; Thermosphere; Ionospheres; Mesosphere; Atmospheric Sounding; Broadband; Radiometers

20080015510 NASA Langley Research Center, Hampton, VA, USA
Utilizing Calibrated GPS Reflected Signals to Estimate Soil Reflectivity and Dielectric Constant: Results from SMEX02
Katzberg, Stephen J.; Torres, Omar; Grant, Michael S.; Masters, Dallas; [2006]; 26 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Extensive reflected GPS data was collected using a GPS reflectometer installed on an HC130 aircraft during the Soil Moisture Experiment 2002 (SMEX02) near Ames, Iowa. At the same time, widespread surface truth data was acquired in the form of point soil moisture profiles, areal sampling of near-surface soil moisture, total green biomass and precipitation history, among others. Previously, there have been no reported efforts to calibrate reflected GPS data sets acquired over land. This paper reports the results of two approaches to calibration of the data that yield consistent results. It is shown that estimating the strength of the reflected signals by either (1) assuming an approximately specular surface reflection or (2) inferring the surface slope probability density and associated normalization constants give essentially the same results for the conditions encountered in SMEX02. The corrected data is converted to surface reflectivity and then to dielectric constant as a test of the calibration approaches. Utilizing the extensive in-situ soil moisture related data this paper also presents the results of comparing the GPS-inferred relative dielectric constant with the Wang-Schmugge model frequently used to relate volume moisture content to dielectric constant. It is shown that the calibrated GPS reflectivity estimates follow the expected dependence of permittivity with volume moisture, but with the following qualification: The soil moisture value governing the reflectivity appears to come from only the top 1-2 centimeters of soil, a result consistent with results found for other microwave techniques operating at L-band. Nevertheless, the experimentally derived dielectric constant is generally lower than predicted. Possible explanations are presented to explain this result.
Author
Reflectometers; Soil Moisture; Moisture Content; Global Positioning System; Ground Truth; Dielectrics; Specular Reflection

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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*.

20080014250 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Advanced Radioisotope Power Systems Segmented Thermoelectric Research
Caillat, Thierry; December 13, 2004; 27 pp.; In English; Direct Energy Conversion Program Review and Workshop, 13-15 Dec. 2004, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40661

Flight times are long; - Need power systems with >15 years life. Mass is at an absolute premium; - Need power systems with high specific power and scalability. 3 orders of magnitude reduction in solar irradiance from Earth to Pluto. Nuclear power sources preferable. The Overall objective is to develop low mass, high efficiency, low-cost Advanced Radioisotope Power System with double the Specific Power and Efficiency over state-of-the-art Radioisotope Thermoelectric Generators (RTGs).
Derived from text
Thermoelectric Generators; Light (Visible Radiation); Power Efficiency; Solar Radiation; Low Cost

20080014451 Naval Postgraduate School, Monterey, CA USA

FPGA Based Compensation Method for Correcting Distortion in Voltage Inverters

Williamson, Kenya D; Dec 2007; 97 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475848; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475848

This thesis presents a method to compensate for the blanking time distortion in Space Vector Modulated (SVM) voltage source inverters. Blanking time distortion is caused by the delay inserted to prevent the short circuit that would occur if the two transistors in the same inverter leg are both on at the same time. This delay produces harmonic distortion and non-linearity when two-switch phase legs are used in inverters to generate sinusoidal voltages for various types of AC loads. The approach in this thesis uses a Field Programmable Gate Array to create a pulse by pulse compensation technique that adjusts the symmetric SVM pulses in an attempt to eliminate the voltage distortion caused by the blanking time effect. This technique is evaluated through simulation and experimental results. This thesis proves that the delay caused by the insertion of blanking time can be compensated using a Field Programmable Gate Array and that the blanking time delay is not the dominant source of the 5th and 7th lower order harmonic distortion in voltage source inverters at low voltages.

DTIC

Correction; Distortion; Electric Potential; Field-Programmable Gate Arrays; Inverters

20080014468 Naval Postgraduate School, Monterey, CA USA

An Analysis of the USA Air Force Energy Savings Performance Contracts

President, Wai; Dec 2007; 91 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475888; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475888

The purpose of this paper is to explore the use of Energy Savings Performance Contracts (ESPC) within the Department of Defense, focusing on the USA Air Force's utility and energy acquisition. The significant value of the ESPC is its alternative financing mechanism that authorizes Federal facilities recapitalization without upfront investments. The paper focuses on Dyess Air Force Base's ESPC, as Dyess's benchmarking ESPC was selected for the Presidential Award recognition for Leadership in Federal Energy Management. The six major contracting processes within the three main management levels encompass many of the best-practice characteristics. The interviews referenced herein with the service end-users, both the regional and local contracting officers, allow the reader to further understand how the Integrated Product Team's significant efforts resulted in a successful ESPC.

DTIC

Contract Management; Energy Conservation; Energy Policy; United States

20080014510 Naval Postgraduate School, Monterey, CA USA

Green Energy for the Battlefield

Halcrow, Stephanie D; Dec 2007; 95 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475991; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475991

The amount of energy the USA (U.S.) consumes increases every year and this growth in energy consumption outpaces energy production. To fill this gap, the U.S. imports thirty-five percent of its energy. More importantly, the U.S. imports over 60 percent of its total oil consumption. Our country's energy production, especially our transportation sector, is highly dependent on foreign sources. Add to this, 70 percent of this energy is from non-renewable sources and this same 70 percent is petroleum-based, which produces greenhouse gas emissions. Renewable energy sources and alternative fuels have proven to be energy efficient, cost effective and environmentally friendly. Additionally, they reduce the country's dependence on foreign sources. The military is adopting many types of renewable energy sources and alternative fuels for use and the results are impressive. However, the majority of implementation is here in the USA. These same benefits experienced at home are available for the battlefield: improved energy efficiency, cost savings and less impact on the environment. This paper discusses the available green energy sources and their potential use for the battlefield. Additionally, it offers several ways to further the use and maximize the benefits of green energy on the battlefield.

DTIC

Energy Consumption; Greenhouse Effect

20080014515 Naval Postgraduate School, Monterey, CA USA

Nellis Air Force Base, Nevada Photovoltaic Project

Henley, Curtis D; Hunt, Shaun C; Phillips, Darius A; Dec 2007; 241 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475999

The objective of this Joint Applied Project was to analyze the feasibility for production of renewable energy on DoD installations and focus on renewable energy initiatives undertaken at Nellis AFB, NV. This project examines the necessary criteria and preconditions for consideration of renewable energy production on DoD installations and how the Government establishes contracting devices with local power generating companies. This project analyzes the Nellis AFB initiative as a model because of its commitment in meeting DoD renewable energy goals while saving taxpayer dollars and demonstrating the feasibility of producing energy without fossil fuels. Strengths and weaknesses of the renewable energy requirements generation and contracting processes used by Nellis AFB are captured and analyzed. Additionally, this project provides a recommendation of whether or not the analyzed processes used for the Nellis AFB initiative can be utilized, in part or in whole, at other Air Force bases.

DTIC

Contract Management; Electric Generators; Electric Power Plants; Military Air Facilities; Renewable Energy; Solar Energy

20080014526 Naval Postgraduate School, Monterey, CA USA

Determining the Return of Energy Efficiency Investments in Domestic and Deployed Military Installations

Gammache, Nathan J; Dec 2007; 101 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476033; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476033

The purpose of this research is to determine the return on energy efficiency investments in domestic installations and military forward operating bases. This research considers two current options for increasing energy efficiency at military installations: the use of Energy Savings Performance Contracts to fund energy efficiency improvements at domestic military installations, and the use of waste to energy generators at remote, deployed military installations. In domestic military installations, energy requirements are provided primarily via external utilities. Energy saving efforts at domestic installations seek to reduce utility expenses by private equity investment in energy efficiency technologies. In remote military installations, generators provide the majority of electricity by burning fossil fuels delivered from fuel convoys. Forward deployed installation energy efficiency can be achieved through expanded on-site use of alternative fuels. By using field waste as a fuel source, the external fuel demand at forward military operating bases may be reduced. Estimated financial returns of these energy efficiency methods are included in the analyses of this research. This research also discusses the governmental policies mandating energy efficiency and explains how involved parties benefit financially from energy efficiency investments.

DTIC

Deployment; Energy Conservation; Energy Policy; Fuel Consumption

20080014649 Princeton Univ., NJ USA

Very High Performance Organic Photonic Devices

Forrest, Stephen; Jan 15, 2008; 82 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0120

Report No.(s): AD-A476099; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective was to demonstrate very high efficiency, low cost organic solar cells on flexible substrates based on vapor-deposited thin film organic semiconductors. Our goal is to obtain solar power conversion efficiencies of >10% -- a value without precedent in over 30 years of science and engineering targeted at achieving practical organic solar energy conversion devices. A further objective is to demonstrate an electrically pumped organic thin film laser, again based on vapor-deposited molecular organic materials. The motivation for this investigation is the temperature independent wavelength and threshold characteristics of organic lasers. We will pursue two very promising and innovative approaches: employing high Q cavities where electrically pumped polaritons are generated, and the use of high intensity OLEDs to pump a low threshold light emitting film positioned in an integrated optical cavity.

DTIC

Low Cost; Organic Materials; Solar Cells

20080015455 Office of Inspector General, Arlington, VA USA
Special Inspector General for Iraq Reconstruction (SIGIR): Moving Beyond the IRRF
Bowen, Jr, Stuart W; Apr 30, 2007; 632 pp.; In English
Report No.(s): AD-A476277; No Copyright; Avail.: Defense Technical Information Center (DTIC)

I am pleased to submit to the Congress, Secretary Rice, Secretary Gates, and the American people the 13th Quarterly Report from the Special Inspector General for Iraq Reconstruction (SIGIR). During this quarter, I traveled to Iraq for the 15th time since my appointment three years ago to supervise the work of the 50 SIGIR auditors, inspectors, and investigators who provide the necessary, in-country oversight of the U.S. taxpayers investment in Iraq's reconstruction. This Report marks a significant evolution in the U.S. relief and reconstruction effort in Iraq: the part of the U.S. program supported by the Iraq Relief and Reconstruction Fund (IRRF) is nearly complete. Concomitantly, the Government of Iraq (GOI) is assuming progressively more of the financial burden for Iraq's continued recovery. This important shift, however, does not signify the end of substantial U.S. assistance to Iraq. To the contrary, American support for Iraq's recovery will remain relatively robust for the foreseeable future. The evolution of the IRRF means that SIGIR s oversight mission in Iraq is evolving as well. Pursuant to its congressional directive, SIGIR continues to report on the investment of the IRRF and the relief funds appropriated in FY 2006. Over the remaining course of this year, however, SIGIR will adjust its personnel footprint in Iraq to comport with its gradually diminishing mission. SIGIR previously used Section 2 of its Quarterly Reports to provide sector-by-sector updates on the IRRF program. Henceforth, Section 2 will include broader reviews of what was achieved through the overall reconstruction effort. In this Report, SIGIR compares the goals and expectations of IRRF 2 with projects and activities actually completed. Section 2 also contains a review of current U.S. funding programs supporting Iraq's recovery. This quarter, SIGIR continued its comprehensive, on-the-ground oversight of Iraq reconstruction; Section 3 contains summaries of this work.
DTIC
Economic Development; Iraq

20080015496 Office of Inspector General, Arlington, VA USA
Special Inspector General for Iraq Reconstruction (SIGIR): The Year of Transition Enters the Fourth Quarter
Bowen, Jr, Stuart W; Oct 30, 2006; 532 pp.; In English
Report No.(s): AD-A476276; No Copyright; Avail.: Defense Technical Information Center (DTIC)

I am pleased to submit to the Congress, Secretary Rice, Secretary Rumsfeld, and the American people, the 11th Quarterly Report from the Special Inspector General for Iraq Reconstruction (SIGIR). SIGIR's mission, in simple terms, is to account for U.S. taxpayer funds invested in the reconstruction of Iraq. As this Report indicates, that accounting reveals a mixed story, with many successful projects completed while others fall short. This story underscores the importance of ensuring that the next phase of Iraq reconstruction stays on track. SIGIR remains committed to doing its part toward achieving that goal. Of significant note, the Department of State continues to provide exemplary support for the reconstruction mission and SIGIR's oversight of it. The Iraq relief and reconstruction program has entered the fourth quarter in this Year of Transition. Section 1 of the Report contains SIGIR's observations about this development, emphasizing several urgent matters that require action. Section 2 of this Report provides SIGIR's sector-by-sector analyses of reconstruction; Section 3 summarizes SIGIR's audits, inspections, and investigations; and Section 4 provides reporting on other agencies oversight activity.
DTIC
Economic Development; Iraq

20080015526 NASA Marshall Space Flight Center, Huntsville, AL, USA
Flow Components in a NaK Test Loop Designed to Simulate Conditions in a Nuclear Surface Power Reactor
Polzin, Kurt A.; Godfroy, Thomas J.; February 10, 2008; 7 pp.; In English; Space Technology and Applications International Forum (STAIF) 2008/New Mexico's Institute for Space and Nuclear Power Studies, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015526

A test loop using NaK as the working fluid is presently in use to study material compatibility effects on various components that comprise a possible nuclear reactor design for use on the lunar surface. A DC electromagnetic (EM) pump has been designed and implemented as a means of actively controlling the NaK flow rate through the system and an EM flow sensor is employed to monitor the developed flow rate. These components allow for the matching of the flow rate conditions in test loops with those that would be found in a full-scale surface-power reactor. The design and operating characteristics of the EM pump and flow sensor are presented. In the EM pump, current is applied to a set of electrodes to produce a Lorentz body force in the fluid. A measurement of the induced voltage (back-EMF) in the flow sensor provides the means of

monitoring flow rate. Both components are compact, employing high magnetic field strength neodymium magnets thermally coupled to a water-cooled housing. A vacuum gap limits the heat transferred from the high temperature NaK tube to the magnets and a magnetically-permeable material completes the magnetic circuit. The pump is designed to produce a pressure rise of 5 psi, and the flow sensor's predicted output is roughly 20 mV at the loop's nominal flow rate of 0.5 GPM.
Author
Nuclear Reactors; Electromagnetic Pumps; Design Analysis; High Field Magnets; Flow Velocity; Nuclear Power Reactors; Reactor Design; Pressure Sensors

20080015576 Office of Inspector General, Arlington, VA USA
Special Inspector General for Iraq Reconstruction (SIGIR): April 2006 Quarterly Report
Bowen, Jr, Stuart W; Apr 30, 2006; 364 pp.; In English
Report No.(s): AD-A476273; No Copyright; Avail.: Defense Technical Information Center (DTIC)

I am pleased to submit to the U.S. Congress and the Secretaries of State and Defense the ninth Quarterly Report from the Special Inspector General for Iraq Reconstruction (SIGIR). As this year of transition in Iraq reconstruction unfolds, U.S.-funded projects are rapidly being completed and transferred to Iraqi management and control. Within that context, SIGIR identifies, in Section 1 of this Report, five critical issues the resolution of which will help advance Iraq toward economic prosperity and democratic success. Section 2 of this Report updates SIGIR s previous reviews of Iraq s essential service sectors oil and gas, electricity, and water and provides initial reports on the following sectors: security; transportation and communications; health care; and democracy, education, and private sector development. Section 3 of this Report provides summaries of SIGIR audits, inspections, and investigations performed this quarter. Notable among the audits is a performance review of the contract to construct primary health care centers across Iraq. SIGIR inspectors continued to meet their mission this quarter, which is to visit project sites from every sector and geographical region in Iraq and report on the quality of the work performed. SIGIR s investigators continued work on more than 70 cases in Iraq and the U.S., combating and detering fraud. This Report also contains a thorough review of the history and status of investments in Iraq s relief and reconstruction by non-U.S. donor nations and international institutions, as well as a summary of Iraq s current debt situation. SIGIR's Lessons Learned initiative made progress this quarter toward the publication of the contracting report, which will be out next quarter. The Lessons Learned forum on program and project management was held in April, and that report will be out in the summer of 2006.
DTIC
Iraq; Project Management; Economic Development

20080015611 Office of Inspector General, Arlington, VA USA
Special Inspector General for Iraq Reconstruction. Quarterly Report to the USA Congress
Bowen, Jr, Stuart W; Oct 30, 2007; 244 pp.; In English
Report No.(s): AD-A476364; No Copyright; Avail.: Defense Technical Information Center (DTIC)

I am pleased to submit to the Congress, Secretary Rice, Secretary Gates, and the American people the 15th Quarterly Report from the Special Inspector General for Iraq Reconstruction (SIGIR). During this quarter, I visited Iraq for the 17th time since 2004 to continue SIGIR's robust and rigorous oversight of the U.S. relief and reconstruction program in Iraq. Two notable developments frame this Report. First, total relief and reconstruction investment for Iraq from all sources the USA, Iraq, and other donors passed the $100 billion mark this quarter. Second, total attacks on Coalition forces and Iraqis dropped to their lowest levels in more than a year, primarily because of successes achieved through the surge strategy. SIGIR's oversight team passed two noteworthy milestones this quarter. We have now produced more than 100 audits and more than 100 inspections since SIGIR began its mission more than three years ago. This collective body of work, together with the many investigations SIGIR has carried out, stand as a testament to the important benefits that focused and fair oversight can contribute to the important mission in Iraq. This Report speaks to notable signs of success on these fronts infrastructure outputs, the security environment, and the Commander's Emergency Response Program (CERP). On the infrastructure front, new U.S.-financed electrical projects, a drop in attacks on the electrical grid, and improved maintenance programs helped push Iraq's electricity output this quarter to its highest levels since the 2003 invasion. On the security front, increasing pressure from the surge produced a palpable drop in attacks. And on the CERP front, SIGIR's inspection teams visited four CERP projects and generally found them in good condition. SIGIR audits and inspections this quarter report on the consequences of poor program management practices, and we continue to press for improvement.
DTIC
Congressional Reports; Economic Development; Iraq; United States

20080015651 NASA Marshall Space Flight Center, Huntsville, AL, USA
Reactivity Studies of Inconel 625 with Sodium, and Lunar Regolith Stimulant
Gillies, Donald; Salvail, Pat; Reid, Bob; Colebaugh, James; Easterling, Greg; February 10, 2008; 1 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; Copyright; Avail.: Other Sources; Abstract Only

In the event of the need for nuclear power in exploration, high flux heat pipes will be needed for heat transfer from space nuclear reactors to various energy conversion devices, and to safely dissipate excess heat. Successful habitation will necessitate continuous operation of alkali metal filled heat pipes for 10 or-more years in a hostile environment with little maintenance. They must be chemical and creep resistant in the high vacuum of space (lunar), and they must operate reliably in low gravity conditions with intermittent high radiation fluxes. One candidate material for the heat pipe shell, namely Inconel 625, has been tested to determine its compatibility with liquid sodium. Any reactivity could manifest itself as a problem over the long time periods anticipated. In addition, possible reactions with the lunar regolith will take place, as will evaporation of selected elements at the external surfaces of the heat pipes, and so there is a need for extensive long-term testing under simulated lunar conditions.
Author
Nuclear Reactors; Heat Pipes; Heat Transfer; Energy Conversion; Creep Strength; Alkali Metals; Inconel (Trademark)

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20080014321 NASA Langley Research Center, Hampton, VA, USA
Black Carbon Concentration from Worldwide Aerosol Robotic Network (AERONET)
Schuster, Greg; Dubovik, Oleg; Holben, Brent; Clothiaux, Eugene; [2008]; 46 pp.; In English; 5th AeroCom Workshop, 17-19 Oct. 2006, Virginia Beach, VA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 921266.04.07.07; Copyright; Avail.: CASI: A03, Hardcopy

Worldwide black carbon concentration measurements are needed to assess the efficacy of the carbon emissions inventory and transport model output. This requires long-term measurements in many regions, as model success in one region or season does not apply to all regions and seasons. AERONET is an automated network of more than 180 surface radiometers located throughout the world. The sky radiance measurements obtained by AERONET are inverted to provide column-averaged aerosol refractive indices and size distributions for the AERONET database, which we use to derive column-averaged black carbon concentrations and specific absorptions that are constrained by the measured radiation field. This provides a link between AERONET sky radiance measurements and the elemental carbon concentration of transport models without the need for an optics module in the transport model. Knowledge of both the black carbon concentration and aerosol absorption optical depth (i.e., input and output of the optics module) will enable improvements to the transport model optics module.
Author
Carbon; Aerosols; Particle Density (Concentration); Air Pollution; Pollution Monitoring; Radiometers; Soot; Environmental Transport; Robotics

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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*.

20080014295 NASA Langley Research Center, Hampton, VA, USA
Comparison Between Lidar and Nephelometer Measurements of Aerosol Hygroscopicity at the Southern Great Plains Atmospheric Radiation Measurement Site
Pahlow, M.; Feingold, G.; Jefferson, A.; Andrews, E.; Ogren, J. A.; Wang, J.; Lee, Y.-N.; Ferrare, R. A.; Journal of Geophysical Research; [2004]; Volume 111, pp. 1-8; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DE-A103-02ER63324; 23R-22-44-9T09-01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014295

Aerosol hygroscopicity has a significant effect on radiative properties of aerosols. Here a lidar method, applicable to

cloud-capped, well-mixed atmospheric boundary layers, is employed to determine the hygroscopic growth factor f(RH) under unperturbed, ambient atmospheric conditions. The data used for the analysis were collected under a wide range of atmospheric aerosol levels during both routine measurement periods and during the intensive operations period (IOP) in May 2003 at the Southern Great Plains (SGP) Climate Research Facility in Oklahoma, USA, as part of the Atmospheric Radiation Measurement (ARM) program. There is a good correlation (approx. 0.7) between a lidar-derived growth factor (measured over the range 85% RH to 96% RH) with a nephelometer-derived growth factor measured over the RH range 40% to 85%. For these RH ranges, the slope of the lidar-derived growth factor is much steeper than that of the nephelometer-derived growth factor, reflecting the rapid increase in particle size with increasing RH. The results are corroborated by aerosol model calculations of lidar and nephelometer equivalent f(RH) based on in situ aerosol size and composition measurements during the IOP. It is suggested that the lidar method can provide useful measurements of the dependence of aerosol optical properties on relative humidity, and under conditions closer to saturation than can currently be achieved with humidified nephelometers.
Author
Aerosols; Atmospheric Radiation; Great Plains Corridor (North America); Hygroscopicity; Optical Radar; Radiation Measurement

20080014528 Scripps Institution of Oceanography, La Jolla, CA USA
Passive Imaging System for Measuring Atmospheric Scattering: Quarterly Report October 2007
Shields, J E; Nov 1, 2007; 3 pp.; In English
Contract(s)/Grant(s): N00014-07-1-1060
Report No.(s): AD-A476037; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476037
This quarterly report describes the work done for the 'Passive Imaging System for Measuring Atmospheric Scattering and CFLOS', under ONR Contract N00014-07-1-1060, between 1 August 2007 and 31 October 2007.
DTIC
Atmospheric Scattering; Imaging Techniques; Line of Sight

20080014831 NASA Johnson Space Center, Houston, TX, USA
Mars Sample Return: The Value of Depth Profiles
Hausrath, E. M.; Navarre-Sitchler, A. K.; Moore, J.; Sak, P. B.; Brantley, S. L.; Golden, D. C.; Sutter, B.; Schroeder, C.; Socki, R.; Morris, R. V.; Ming, D. W.; [2008]; 2 pp.; In English; Ground Truth from Mars: Science Payoff, 21-23 Apr. 2008, Albuquerque, Mexico; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy
Sample return from Mars offers the promise of data from Martian materials that have previously only been available from meteorites. Return of carefully selected samples may yield more information about the history of water and possible habitability through Martian history. Here we propose that samples collected from Mars should include depth profiles of material across the interface between weathered material on the surface of Mars into unweathered parent rock material. Such profiles have the potential to yield chemical kinetic data that can be used to estimate the duration of water and information about potential habitats on Mars.
Derived from text
Mars Surface Samples; Mars Sample Return Missions; Space Exploration; Meteorites; Habitability; Mars Surface; Habitats

20080014849 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Comparison of Polar Motion Excitation Series Derived from GRACE and from Analyses of Geophysical Fluids
Nastula, J.; Ponte, R. M.; Salstein, D. A.; June 13, 2007; 1 pp.; In English
Contract(s)/Grant(s): NNG04GF93G; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/ 10.1029/2006GL028983
Three sets of degree-2, order-1 harmonics of the gravity field, derived from the Gravity Recovery and Climate Experiment (GRACE) data processed at the Center for Space Research (CSR), Jet Propulsion Laboratory (JPL) and GeoforschungsZentrum (GFZ), are used to compute polar motion excitation functions X1 and X2. The GFZ and JPL excitations and the CSR X2, excitation compare generally well with geodetically observed excitation after removal of effects of oceanic currents and atmospheric winds. The agreement considerably exceeds that from previous GRACE data releases. For the JPL series, levels of correlation with the geodetic observations and the variance explained are comparable to, but still lower than, those obtained independently from available models and analyses of the atmosphere, ocean, and land hydrology.

Improvements in data quality of gravity missions are still needed to deliver even tighter constraints on mass-related excitation of polar motion.
Author
Atmospheric Models; Geodetic Surveys; Geophysical Fluids; Gravitational Fields; Wind (Meteorology); Marine Meteorology

20080015380 Science Applications International Corp., San Diego, CA USA
The Physical Basis of the Explosion Source and Generation of Regional Seismic Phases
Stevens, Jeffrey L; Baker, G E; Xu, Heming; Aug 31, 2007; 156 pp.; In English
Contract(s)/Grant(s): FA8718-04-C-0025; Proj-1010
Report No.(s): AD-A476024; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476024

The goal of this project is to understand explosion generation of shear waves. We quantify contribution of surface reflected pS, S*, scattered Rg, and S directly generated by non-spherical source elements to local and regional S-wave phases in high and low velocity source media through simulations and data analysis. Data include a large set of historical local records of Semipalatinsk nuclear explosions digitized for this project by Institute for the Dynamics of the Geospheres (IDG) in Moscow, Russia, Soviet Deep Seismic Sounding experiments, regional records of NTS explosions, and local and regional Kazakh depth of burial experiment records. Simulations include non-linear, Lagrangian finite-difference calculations to model source generation, 2 and 3D finite-difference calculations to model near source scattering effects, a new modal scattering calculation to estimate the upper on Rg-to-Lg scattering, and wavenumber synthetics for multiple source and propagation effects. We find that source generated S waves dominate the regional S phases for a high velocity source region, and trapped pS dominates Lg for low velocity sources, although direct generation is necessary for Sn. Rg scattering may contribute in both cases, but at lower frequencies (< 1 Hz).
DTIC
Explosions; Nuclear Explosions; S Waves; Scattering; Seismology; Shear Properties

20080015426 NASA Langley Research Center, Hampton, VA, USA
A Reevaluation of Airborne HO(x) Observations from NASA Field Campaigns
Olson, Jennifer; Crawford, James H.; Chen, Gao; Brune, William H.; Faloona, Ian C.; Tan, David; Harder, Hartwig; Martinez, Monica; [2005]; 33 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://dx.doi.org/10.1029/2005JD006617

In-situ observations of tropospheric HO(x) (OH and HO2) obtained during four NASA airborne campaigns (SUCCESS, SONEX, PEM-Tropics B and TRACE-P) are reevaluated using the NASA Langley time-dependent photochemical box model. Special attention is given to previously diagnosed discrepancies between observed and predicted HO2 which increase with higher NO(x) levels and at high solar zenith angles. This analysis shows that much of the model discrepancy at high NO(x) during SUCCESS can be attributed to modeling observations at time-scales too long to capture the nonlinearity of HO(x) chemistry under highly variable conditions for NO(x). Discrepancies at high NO(x) during SONEX can be moderated to a large extent by complete use of all available precursor observations. Differences in kinetic rate coefficients and photolysis frequencies available for previous studies versus current recommendations also explain some of the disparity. Each of these causes is shown to exert greater influence with increasing NO(x) due to both the chemical nonlinearity between HO(x) and NO(x) and the increased sensitivity of HO(x) to changes in sources at high NO(x). In contrast, discrepancies at high solar zenith angles will persist until an adequate nighttime source of HO(x) can be identified. It is important to note that this analysis falls short of fully eliminating the issue of discrepancies between observed and predicted HO(x) for high NO(x) environments. These discrepancies are not resolved with the above causes in other data sets from ground-based field studies. Nevertheless, these results highlight important considerations in the application of box models to observationally based predictions of HO(x) radicals.
Author
Hydrogen Compounds; Photochemical Reactions; Troposphere; Photolysis; Oxides

20080015655 NASA Marshall Space Flight Center, Huntsville, AL, USA
Measurements of Charging of Apollo 17 Lunar Dust Grains by Electron Impact
Abbas, Mian M.; Tankosic, Dragana; Spann, James F.; Dube, Michael J.; February 10, 2008; 9 pp.; In English; Space Technology and Applications International Forum (STAIF-2008), 10-14 Feb. 2008, Albuquerque, Mexico; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

It is well known since the Apollo missions that the lunar surface is covered with a thick layer of micron size dust grains

with unusually high adhesive characteristics. The dust grains observed to be levitated and transported on the lunar surface are believed to have a hazardous impact on the robotic and human missions to the Moon. The observed dust phenomena are attributed to the lunar dust being charged positively during the day by UV photoelectric emissions, and negatively during the night by the solar wind electrons. The current dust charging and the levitation models, however, do not fully explain the observed phenomena, with the uncertainty of dust charging processes and the equilibrium potentials of the individual dust grains. It is well recognized that the charging properties of individual dust grains are substantially different from those determined from measurements made on bulk materials that are currently available. An experimental facility has been developed in the Dusty Plasma Laboratory at MSFC for investigating the charging and optical properties of individual micron/sub-micron size positively or negatively charged dust grains by levitating them in an electrodynamic balance in simulated space environments. In this paper, we present the laboratory measurements on charging of Apollo 17 individual lunar dust grains by a low energy electron beam. The charging rates and the equilibrium potentials produced by direct electron impact and by secondary electron emission process are discussed.
Author
Lunar Dust; Photoelectric Emission; Aerospace Environments; Electron Emission; Electron Impact; Lunar Surface

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080014265 NASA Langley Research Center, Hampton, VA, USA
A Climatology of Midlatitude Continental Clouds from the ARM SGP Central Facility, Part II, Cloud Fraction and Radiative Forcing
Dong, Xiquan; Xi, Baike; Minnis, Patrick; Journal of Climate; [2006]; Volume 19, No. 9, pp. 1765-1783; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DE-AI02-97ER62341; NNL04AA11G; 23R-622-43-iT01-01; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014265

Data collected at the Department of Energy Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) central facility are analyzed for determining the variability of cloud fraction and radiative forcing at several temporal scales between January 1997 and December 2002. Cloud fractions are estimated for total cloud cover and for single-layer low (0-3 km), middle (3-6 km), and high clouds (greater than 6 km) using ARM SGP ground-based paired lidar-radar measurements. Shortwave (SW), longwave (LW), and net cloud radiative forcings (CRF) are derived from up- and down-looking standard precision spectral pyranometers and precision infrared radiometer measurements. The annual averages of total, and single-layer, nonoverlapped low, middle and high cloud fractions are 0.49, 0.11, 0.03, and 0.17, respectively. Total and low cloud amounts were greatest from December through March and least during July and August. The monthly variation of high cloud amount is relatively small with a broad maximum from May to August. During winter, total cloud cover varies diurnally with a small amplitude, mid-morning maximum and early evening minimum, and during summer it changes by more than 0.14 over the daily cycle with a pronounced early evening minimum. The diurnal variations of mean single-layer cloud cover change with season and cloud height. Annual averages of all-sky, total, and single-layer high, middle, and low LW CRFs are 21.4, 40.2, 16.7, 27.2, and 55.0 Wm(sup -2), respectively; and their SW CRFs are -41.5, -77.2, -37.0, -47.0, and -90.5 Wm(sup -2). Their net CRFs range from -20 to -37 Wm(sup -2). For all-sky, total, and low clouds, the maximum negative net CRFs of -40.1, -70, and -69.5 Wm(sup -2), occur during April; while the respective minimum values of -3.9, -5.7, and -4.6 Wm(sup -2), are found during December. July is the month having maximum negative net CRF of -46.2 Wm(sup -2) for middle clouds, and May has the maximum value of -45.9 Wm(sup -2) for high clouds. An uncertainty analysis demonstrates that the calculated CRFs are not significantly affected by the difference between clear-sky and cloudy conditions. A more comprehensive cloud fraction study from both surface and satellite observations will follow.
Author
Atmospheric Radiation; Climatology; Great Plains Corridor (North America); Radiation Measurement; Cloud Cover; Temperate Regions

20080014268 NASA Langley Research Center, Hampton, VA, USA

Cloud Radiative Forcing at the ARM Climate Research Facility, Part 1, Technique, Validation, and Comparison to Satellite-derived Diagnostic Quantities

Mace, Gerald G.; Benson, Sally; Sonntag, Karen L.; Kato, Seiji; Min, Qilong; Minnis, Patrick; Twohy, Cynthia H.; Poellot, Michael; Dong, Xiquan; Long, Charles; Zhang, Qiuqing; Doelling, David R.; Journal of Geophysical Research; [2006]; Volume 111, pp. 1-28; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL04AA26G; 23R-622-43-9T01-01; Copyright; Avail.: CASI: A05, Hardcopy

It has been hypothesized that continuous ground-based remote sensing measurements from active and passive remote sensors combined with regular soundings of the atmospheric thermodynamic structure can be combined to describe the effects of clouds on the clear sky radiation fluxes. We critically test that hypothesis in this paper and a companion paper (Part II). Using data collected at the Southern Great Plains (SGP) Atmospheric Radiation Measurement (ARM) site sponsored by the U.S. Department of Energy, we explore an analysis methodology that results in the characterization of the physical state of the atmospheric profile at time resolutions of five minutes and vertical resolutions of 90 m. The description includes thermodynamics and water vapor profile information derived by merging radiosonde soundings with ground-based data, and continues through specification of the cloud layer occurrence and microphysical and radiative properties derived from retrieval algorithms and parameterizations. The description of the atmospheric physical state includes a calculation of the infrared and clear and cloudy sky solar flux profiles. Validation of the methodology is provided by comparing the calculated fluxes with top of atmosphere (TOA) and surface flux measurements and by comparing the total column optical depths to independently derived estimates. We find over a 1-year period of comparison in overcast uniform skies, that the calculations are strongly correlated to measurements with biases in the flux quantities at the surface and TOA of less than 10% and median fractional errors ranging from 20% to as low as 2%. In the optical depth comparison for uniform overcast skies during the year 2000 where the optical depth varies over 3 orders of magnitude we find a mean positive bias of 46% with a median bias of less than 10% and a 0.89 correlation coefficient. The slope of the linear regression line for the optical depth comparison is 0.86 with a normal deviation of 20% about this line. In addition to a case study where we examine the cloud radiative effects at the TOA, surface and atmosphere by a middle latitude synoptic-scale cyclone, we examine the cloud top pressure and optical depth retrievals of ISCCP and LBTM over a period of 1 year. Using overcast period from the year 2000, we find that the satellite algorithms tend to bias cloud tops into the middle troposphere and underestimate optical depth in high optical depth events (greater than 100) by as much as a factor of 2.

Author

Climatology; Clouds (Meteorology); Remote Sensing; Radiation Measurement; Atmospheric Radiation

20080014270 NASA Langley Research Center, Hampton, VA, USA

Impact of CAMEX-4 Data Sets for Hurricane Forecasts using a Global Model

Kamineni, Rupa; Krishnamurti, T. N.; Pattnaik, S.; Browell, Edward V.; Ismail, Syed; Ferrare, Richard A.; Journal of the Atmospheric Sciences; February 07, 2005; Volume 63, No. 1, pp. 151-174; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG8-1848; NAG8-1537; 23-258-70-SL; Copyright; Avail.: CASI: A04, Hardcopy

This study explores the impact on hurricane data assimilation and forecasts from the use of dropsondes and remote-sensed moisture profiles from the airborne Lidar Atmospheric Sensing Experiment (LASE) system. We show that the use of these additional data sets, above those from the conventional world weather watch, has a positive impact on hurricane predictions. The forecast tracks and intensity from the experiments show a marked improvement compared to the control experiment where such data sets were excluded. A study of the moisture budget in these hurricanes showed enhanced evaporation and precipitation over the storm area. This resulted in these data sets making a large impact on the estimate of mass convergence and moisture fluxes, which were much smaller in the control runs. Overall this study points to the importance of high vertical resolution humidity data sets for improved model results. We note that the forecast impact from the moisture profiling data sets for some of the storms is even larger than the impact from the use of dropwindsonde based winds.

Author

Hurricanes; Remote Sensing; Atmospheric Moisture; Convection; Numerical Weather Forecasting; Airborne Radar

20080014290 NASA Langley Research Center, Hampton, VA, USA

Evaluation of Daytime Measurements of Aerosols and Water Vapor made by an Operational Raman Lidar over the Southern Great Plains

Ferrare, Richard; Turner, David; Clayton, Marian; Schmid, Beat; Covert, David; Elleman, Robert; Orgren, John; Andrews, Elisabeth; Goldsmith, John E. M.; Jonsson, Hafidi; Journal of Geophysical Research - Atmospheres; [2006]; Volume 111, pp. 1-21; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

Raman lidar water vapor and aerosol extinction profiles acquired during the daytime over the Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) site in northern Oklahoma (36.606 N, 97.50 W, 315 m) are evaluated using profiles measured by in situ and remote sensing instruments deployed during the May 2003 Aerosol Intensive Operations Period (IOP). The automated algorithms used to derive these profiles from the Raman lidar data were first modified to reduce the adverse effects associated with a general loss of sensitivity of the Raman lidar since early 2002. The Raman lidar water vapor measurements, which are calibrated to match precipitable water vapor (PWV) derived from coincident microwave radiometer (MWR) measurements were, on average, 5-10% (0.3-0.6 g/m(exp 3) higher than the other measurements. Some of this difference is due to out-of-date line parameters that were subsequently updated in the MWR PWV retrievals. The Raman lidar aerosol extinction measurements were, on average, about 0.03 km(exp -1) higher than aerosol measurements derived from airborne Sun photometer measurements of aerosol optical thickness and in situ measurements of aerosol scattering and absorption. This bias, which was about 50% of the mean aerosol extinction measured during this IOP, decreased to about 10% when aerosol extinction comparisons were restricted to aerosol extinction values larger than 0.15 km(exp -1). The lidar measurements of the aerosol extinction/backscatter ratio and airborne Sun photometer measurements of the aerosol optical thickness were used along with in situ measurements of the aerosol size distribution to retrieve estimates of the aerosol single scattering albedo (omega(sub o)) and the effective complex refractive index. Retrieved values of omega(sub o) ranged from (0.91-0.98) and were in generally good agreement with omega(sub o) derived from airborne in situ measurements of scattering and absorption. Elevated aerosol layers located between about 2.6 and 3.6 km were observed by the Raman lidar on May 25 and May 27. The airborne measurements and lidar retrievals indicated that these layers, which were likely smoke produced by Siberian forest fires, were primarily composed of relatively large particles (r(sub eff) approximately 0.23 micrometers), and that the layers were relatively nonabsorbing (omega(sub o) approximately 0.96-0.98). Preliminary results show that major modifications that were made to the Raman lidar system during 2004 have dramatically improved the sensitivity in the aerosol and water vapor channels and reduced random errors in the aerosol scattering ratio and water vapor retrievals by an order of magnitude.

Author

Remote Sensing; Aerosols; Daytime; In Situ Measurement; Optical Radar; Water Vapor; Backscattering; Radiation Measurement

20080014297 NASA Langley Research Center, Hampton, VA, USA

Simulation of Shallow Cumuli and Their Transition to Deep Convective Clouds by Cloud-resolving Models with Different Third-order Turbulence Closures

Cheng, Anning; Xu, Kuan-Man; Quarterly Journal of the Royal Meteorological Society; [2006]; Volume 132, No. 615, pp. 359-382; In English; Original contains black and white illustrations

Contract(s)/Grant(s): DE-AI02-02ER63318; 23-621-30-06; Copyright; Avail.: CASI: A03, Hardcopy

The abilities of cloud-resolving models (CRMs) with the double-Gaussian based and the single-Gaussian based third-order closures (TOCs) to simulate the shallow cumuli and their transition to deep convective clouds are compared in this study. The single-Gaussian based TOC is fully prognostic (FP), while the double-Gaussian based TOC is partially prognostic (PP). The latter only predicts three important third-order moments while the former predicts all the thirdorder moments. A shallow cumulus case is simulated by single-column versions of the FP and PP TOC models. The PP TOC improves the simulation of shallow cumulus greatly over the FP TOC by producing more realistic cloud structures. Large differences between the FP and PP TOC simulations appear in the cloud layer of the second- and third-order moments, which are related mainly to the underestimate of the cloud height in the FP TOC simulation. Sensitivity experiments and analysis of probability density functions (PDFs) used in the TOCs show that both the turbulence-scale condensation and higher-order moments are important to realistic simulations of the boundary-layer shallow cumuli. A shallow to deep convective cloud transition case is also simulated by the 2-D versions of the FP and PP TOC models. Both CRMs can capture the transition from the shallow cumuli to deep convective clouds. The PP simulations produce more and deeper shallow cumuli than the FP simulations, but the FP simulations produce larger and wider convective clouds than the PP simulations. The temporal evolutions of cloud and precipitation are closely related to the turbulent transport, the cold pool and the cloud-scale circulation. The large amount of turbulent mixing associated with the shallow cumuli slows down the increase of the convective available potential energy and

inhibits the early transition to deep convective clouds in the PP simulation. When the deep convective clouds fully develop and the precipitation is produced, the cold pools produced by the evaporation of the precipitation are not favorable to the formation of shallow cumuli.
Author
Cloud Cover; Convection; Cumulus Clouds; Simulation; Turbulence; Mathematical Models

20080014305 NASA Langley Research Center, Hampton, VA, USA
Single-column Model Intercomparison for a Stably Stratified Atmospheric Boundary Layer
Cuxart, J.; Holtslag, A. A. M.; Steeneveld, G-J; Beare, R. J.; Bazile, E.; Beljaars, A.; Cheng, A.; Conangla, L.; Ek, M.; Freedman, F.; Hamdi, R., et al.; Boundary-Layer Meteorology; January 2004; Volume 118, No. 2, pp. 273-303; In English; Original contains black and white illustrations
Contract(s)/Grant(s): N00014-98-1-0595; REN2002-00486; 23R-291-01-9H04-01; Copyright; Avail.: Other Sources

The parameterization of the stably stratified atmospheric boundary layer is a difficult issue, which has a large impact on the medium-range weather forecasts and on climate integrations. A non-strongly stratified arctic case is simulated by nineteen single-column turbulence schemes. The statistics from the Large-eddy simulation (LES) intercomparison made for the same case by eight different models are used as a guiding reference. The single-column parameterizations include research schemes and operational schemes from major forecast and climate research centres. First order schemes, a large number of turbulence kinetic energy closures, and other proposals have submitted results. There is a large spread in the results; in general, the operational schemes mix more efficiently than the research ones, and the TKE and other higher order closures give results closer to the LES statistics. The sensitivities of the schemes to the parameters of their turbulence closures are partially explored.
Author
Atmospheric Boundary Layer; Parameterization; Mathematical Models; Atmospheric Stratification; Stability; Stratified Flow; Mesoscale Phenomena

20080014333 NASA Marshall Space Flight Center, Huntsville, AL, USA
Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison w/ LIS Satellite Data
Koshak, William; Krider, E. Philip; Murray, Natalie; Boccippio, Dennis; November 27, 2007; 43 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A 'dimensional reduction' (DR) method is introduced for analyzing lightning field changes whereby the number of unknowns in a discrete two-charge model is reduced from the standard eight to just four. The four unknowns are found by performing a numerical minimization of a chi-squared goodness-of-fit function. At each step of the minimization, an Overdetermined Fixed Matrix (OFM) method is used to immediately retrieve the best 'residual source'. In this way, all 8 parameters are found, yet a numerical search of only 4 parameters is required. The inversion method is applied to the understanding of lightning charge retrievals. The accuracy of the DR method has been assessed by comparing retrievals with data provided by the Lightning Detection And Ranging (LDAR) instrument. Because lightning effectively deposits charge within thundercloud charge centers and because LDAR traces the geometrical development of the lightning channel with high precision, the LDAR data provides an ideal constraint for finding the best model charge solutions. In particular, LDAR data can be used to help determine both the horizontal and vertical positions of the model charges, thereby eliminating dipole ambiguities. The results of the LDAR-constrained charge retrieval method have been compared to the locations of optical pulses/flash locations detected by the Lightning Imaging Sensor (LIS).
Author (revised)
Lightning; Electric Fields; Electrical Measurement; Detection; Rangefinding; Satellite Observation; Imaging Radar

20080014393 Southeastern Universities Research Association, Washington, DC USA
SURA Coastal Ocean Observing and Prediction Program (SCOOP)
Draayer, Jerry P; Jan 2006; 11 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0721
Report No.(s): AD-A475668; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475668

The Southeastern University Research Association (SURA) Coastal Ocean Observing and Prediction (SCOOP) program includes university, government, and private sector partners working together to implement information technology (IT)

solutions. The SCOOP program vision is a modular and distributed system for predicting and visualizing the coastal response to extreme atmospheric events, including the damaging and catastrophic effects of storm surge, inundation, and wind waves. SCOOP program partners are creating the 'IT glue' for this interoperable system of systems by modularizing critical components and standardizing the interfaces between the modules. SCOOP emphasizes the transition of 'pre-operational' research activities to operational status, and uses the real-time prediction system as an innovative research tool. SCOOP partners are turning environmental measurement and prediction into a community effort and a real-time collaboration between research institutions and operational agencies.
DTIC
Coasts; Oceans; Scoops

20080014398 General Accounting Office, Washington, DC USA
Army Corps of Engineers. Known Performance Issues with New Orleans Drainage Canal Pumps Have Been Addressed, but Guidance on Future Contracts is Needed
Mittal, Anu K; Woods, William T; Dorn, Terrell G; Dec 2007; 48 pp.; In English
Report No.(s): AD-A475713; GAO-08-288; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475713

Hurricane Katrina caused several breaches in the floodwalls along three drainage canals in New Orleans, contributing to catastrophic flooding. To restore the pre-Katrina level of hurricane-related flood protection, the Army Corps of Engineers (Corps) decided to acquire several large-capacity pumping systems. During the process of acquiring, testing, and installing the pumping systems, issues with the pump contract and operation of the pumping systems came to light, including several identified in a Corps Independent Team Report (ITR). GAO was asked to evaluate the Corps efforts to (1) develop contract specifications and award the contract, (2) address pumping system performance issues, (3) document contract modifications, and (4) reconcile contract payments. GAO reviewed contract and testing documents, observed the operation of the pumping system, and interviewed officials from the Corps, its consultants and contractors, and the ITR team. GAO recommends actions to ensure that future contracts adhere to sound acquisition practices, even for expedited procurements, and to ensure that any required contract documentation is completed and filed in a timely manner.
DTIC
Canals; Disasters; Drainage; Engineers; Pumps

20080014673 Air Univ. Press, Maxwell AFB, AL USA
Sexual Ethics, Organizational Climate, and the Air Expeditionary Force
Urdzik, Christopher J; Toner, Christopher; Apr 2005; 43 pp.; In English
Report No.(s): AD-A476183; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The established Air Force standards prohibiting adultery, fraternization, and unprofessional relationships have long recognized these acts as counter to good order and discipline due to the resulting negative impact on unit cohesion and morale. In the last 10 years, three major factors have combined to make sexual misconduct an increasing topic of concern for the USAF-the Air Expeditionary Force (AEF) rotation cycle, the steadily increasing gender mix serving on active duty, and additional combat roles that have opened to women. Focusing on AEF deployments and Air Force military members, this paper explores societal attitudes and value systems influencing sexual ethics, the Air Force's current approach to instilling values as compared to other military branches, whether there's a better ethical model to help members internalize existing standards, and to tie together some practical actions the commander can take at deployed locations to encourage upholding of established standards. Research for this paper included reviews of Air Force doctrine, operating instructions, and publications; sister service publications; technical articles and books in the fields of ethics, sociology, and philosophy; and general magazine/newspaper articles.
DTIC
Armed Forces (United States); Climate; Ethics; Military Personnel; Organizations; Sex; Sociology

20080014806 Meteorological Satellite Center, Tokyo, Japan
Monthly Report of the Meteorological Satellite Center: November 2007
November 2007; In English; Copyright; Avail.: Other Sources

CD-ROM concerning the August 2007 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud

Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount
CASI
Atmospheric Sounding; Japan; Satellite Observation; Satellite Sounding; Meteorological Parameters

20080014822 NASA Langley Research Center, Hampton, VA, USA
Transporting Stratospheric Water Vapor in the GMI Combo Model
Considine, David B.; March 17, 2007; 19 pp.; In English; GMI Science Team Meeting, 17-19 Mar. 2008, Irvine, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 281945.02.04.01.05; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014822

I discuss the implementation of an H2O transport scheme in the Global Modeling Initiative (GMI) model.
Author
Stratosphere; Water Vapor; Climate Models; Hydrology Models; Atmospheric Moisture; Atmospheric Circulation; Climatology

20080014843 ENSCO, Inc./SPoRT, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA
A Multi-Season Study of the Effects of MODIS Sea-Surface Temperatures on Operational WRF Forecasts at NWS Miami, FL
Case, Jonathan L.; Santos, Pablo; Lazarus, Steven M.; Splitt, Michael E.; Haines, Stephanie L.; Dembek, Scott R.; Lapenta, William M.; January 20, 2008; 10 pp.; In English; 88th American Meteorological Society Annual Meeting; 12th Conference on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface, 20-24 Jan. 2008, New Orleans, LA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Studies at the Short-term Prediction Research and Transition (SPORT) Center have suggested that the use of Moderate Resolution Imaging Spectroradiometer (MODIS) sea-surface temperature (SST) composites in regional weather forecast models can have a significant positive impact on short-term numerical weather prediction in coastal regions. Recent work 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 project's goal is to determine whether 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 WRF 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. Twenty-seven hour forecasts are run dally initialized at 0300, 0900, 1500, and 2100 UTC on a domain with 4-km grid spacing covering the southern half 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. The SSTs are initialized with the NCEP Real-Time Global (RTG) analyses at 1/12deg 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 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 data into the SPORT WRF runs is staggered such that SSTs are updated with a new composite every six hours in each of the WRF runs. From mid-February to July 2007, over 500 parallel WRF simulations have been collected for analysis and verification. This paper will present verification results comparing the NWS MIA operational WRF runs to the SPORT experimental runs, and highlight any substantial differences noted in the predicted mesoscale phenomena for specific cases.
Author
MODIS (Radiometry); Numerical Weather Forecasting; Sea Surface Temperature; Prediction Analysis Techniques; Real Time Operation; Temperature Effects; Earth Observing System (EOS); Environment Models; Imaging Spectrometers

20080014844 ENSCO, Inc./SPoRT, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA
High-Resolution Specification of the Land and Ocean Surface for Improving Regional Mesoscale Model Predictions
Case, Jonathan L.; Lazarus, Steven M.; Splitt, Michael E.; Crosson, William L.; Lapenta, William M.; Jedlovec, Gary J.; Peters-Lidard, Christa D.; January 20, 2008; 13 pp.; In English; 88th American Meteorological Society Annual Meeting; 12th Conference on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface, 20-24 Jan. 2008, New Orleans, LA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The exchange of energy and moisture between the Earth's surface and the atmospheric boundary layer plays a critical role in many meteorological processes. High-resolution, accurate representations of surface properties such as sea-surface temperature (SST), soil temperature and moisture content, ground fluxes, and vegetation are necessary to better understand the Earth-atmosphere interactions and improve numerical predictions of sensible weather. The NASA Short-term Prediction Research and Transition (SPoRT) Center has been conducting separate studies to examine the impacts of high-resolution land-surface initialization data from the Goddard Space Flight Center Land Information System (LIS) on subsequent WRF forecasts, as well as the influence of initializing WRF with SST composites derived from the MODIS instrument. This current project addresses the combined impacts of using high-resolution lower boundary data over both land (LIS data) and water (MODIS SSTs) on the subsequent daily WRF forecasts over Florida during May 2004. For this experiment, the WRF model is configured to run on a nested domain with 9- km and 3-kin grid spacing, centered on the Florida peninsula and adjacent coastal waters of the Gulf of Mexico and Atlantic Ocean. A control configuration of WRF is established to take all initial condition data from the NCEP Eta model. Meanwhile, two WRF experimental runs are configured to use high-resolution initialization data from (1) LIS land-surface data only, and (2) a combination of LIS data and high-resolution MODIS SST composites. The experiment involves running 24-hour simulations of the control WRF configuration, the MS-initialized WRF, and the LIS+MODIS-initialized WRF daily for the entire month of May 2004. All atmospheric data for initial and boundary conditions for the Control, LIS, and LIS+MODIS runs come from the NCEP Eta model on a 40-km grid. Verification statistics are generated at land surface observation sites and buoys, and the impacts of the high-resolution lower boundary data on the development and evolution of mesoscale circulations such as sea and land breezes are examined, This paper will present the results of these WRF modeling experiments using LIS and MODIS lower boundary datasets over the Florida peninsula during May 2004.
Author
Air Land Interactions; MODIS (Radiometry); Moisture Content; Atmospheric Boundary Layer; Surface Temperature; Surface Properties; Vegetation; Sea Surface Temperature; Forecasting

20080014846 Shanghai Astronomical Observatory, China; Atmospheric and Environmental Research, Inc., Lexington, MA, USA
Revised Atmospheric Angular Momentum Series Related to Earth's Variable Rotation under Consideration of Surface Topography
Zhou, Y. H.; Salstein, D. A.; Chen, J. L.; Journal of Geophysical Research; June 29, 2006; Volume 111; 2 pp.; In English
Contract(s)/Grant(s): NNG04GF93G; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1029/2005JD006608

The atmospheric angular momentum is closely related to variations in the Earth rotation. The atmospheric excitation function (AEF), or namely atmospheric effective angular momentum function, is introduced in studying the atmospheric excitation of the Earth's variable rotation. It may be separated into two portions, i.e, the 'wind' terms due to the atmospheric motion relative to the mantle and the 'pressure' terms due to the variations of atmospheric mass distribution evident through surface pressure changes. The AEF wind terms during the period of 1948-2004 are re-processed from the NCEP/NCAR (National Centers for Environmental Prediction-National Center for Atmospheric Research) reanalysis 6-hourly wind and pressure fields. Some previous calculations were approximate, in that the wind terms were integrated from an isobaric lower boundary of 1000 hPa. To consider the surface topography effect, however, the AEF is computed by integration using the winds from the Earth's surface to 10 hPa, the top atmospheric model level, instead of from 1000 hPa. For these two cases, only a minor difference, equivalent to approx. 0.004 milliseconds in length-of-day variation, exists with respect to the axial wind term. However, considerable differences, equivalent to 5-6 milliarcseconds in polar motion, are found regarding equatorial wind terms. We further compare the total equatorial AEF (with and without the topographic effect) with the polar motion excitation function (PMEF) during the period of 1980-2003. The equatorial AEF gets generally closer to the PMEF, and improved coherences are found between them when the topography effect is included. Keywords: Atmospheric angular

momentum, Atmospheric excitation function, Earth rotation, Topography, Wind, Pressure.
Author
Atmospheric Circulation; Angular Momentum; Air Masses; Wind Pressure; Pressure Distribution; Mass Distribution; Atmospheric Models

20080014857 NASA Langley Research Center, Hampton, VA, USA
The Effect of Environmental Conditions on Tropical Deep Convective Systems Observed from the TRMM Satellite
Lin, Bing; Wielicki, Bruce A.; Minnis, Patrick; Chambers, Lin H.; Xu, Kuan-Man; Hu, Yongxiang; Fan, Tai-Fang; January 2005; 52 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-621-30-96; Copyright; Avail.: CASI: A04, Hardcopy

This study uses measurements of radiation and cloud properties taken between January and August 1998 by three Tropical Rainfall Measuring Mission (TRMM) instruments, the Clouds and the Earth's Radiant Energy System (CERES) scanner, the TRMM Microwave Imager (TMI), and the Visible and InfraRed Scanner (VIRS), to evaluate the variations of tropical deep convective systems (DCS) with sea surface temperature (SST) and precipitation. This study finds that DCS precipitation efficiency increases with SST at a rate of approx. 2%/K. Despite increasing rainfall efficiency, the cloud areal coverage rises with SST at a rate of about 7%/K in the warm tropical seas. There, the boundary layer moisture supply for deep convection and the moisture transported to the upper troposphere for cirrus-anvil cloud formation increase by approx. 6.3%/K and approx. 4.0%/K, respectively. The changes in cloud formation efficiency, along with the increased transport of moisture available for cloud formation, likely contribute to the large rate of increasing DCS areal coverage. Although no direct observations are available, the increase of cloud formation efficiency with rising SST is deduced indirectly from measurements of changes in the ratio of DCS ice water path and boundary layer water vapor amount with SST. Besides the cloud areal coverage, DCS cluster effective sizes also increase with precipitation. Furthermore, other cloud properties, such as cloud total water and ice water paths, increase with SST. These changes in DCS properties will produce a negative radiative feedback for the earth's climate system due to strong reflection of shortwave radiation by the DCS. These results significantly differ from some previous hypothesized dehydration scenarios for warmer climates, and have great potential in testing current cloud-system resolving models and convective parameterizations of general circulation models.
Author
Cloud Physics; Microwave Imagery; Precipitation (Meteorology); Rain; TRMM Satellite; Tropical Regions; Convection Clouds

20080014867 NASA Marshall Space Flight Center, Huntsville, AL, USA
A New Handbook for the Development of Space Vehicle Terrestrial Environment Design Requirements.
Johnson, Dale L.; Vaughan, William W.; January 21, 2008; 30 pp.; In English; AMS Conference on Aviation, Range, and Aerospace Meteorology, 21-25 Jan. 2008, New Orleans, LA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A new NASA document entitled 'Terrestrial Environment (Climatic) Criteria Handbook for Use in Aerospace Vehicle Development (NASA-HDBK-1001A) has been developed. The Handbook provides terrestrial environment information, data bases, models, recommendations, etc. for use in the design, development, trade studies, testing, and mission analyses for space (or launch) .vehicles. This document is organized into fourteen specific natural environment disciplines of which some are winds, atmospheric models, thermal radiation, precipitation-for-icing, cloud cover, atmospheric electricity, geologic hazards, toxic chemical release by propulsion systems, and sea state. Atmospheric phenomena play a significant role in the design and flight of aerospace vehicles and in the integrity of the associated aerospace systems and structures. Environmental design criteria guidelines in this document are based on measurements and observations of atmospheric and climatic phenomena relative to various aerospace development, operational, and vehicle launch locations. The natural environment criteria guidelines data presented in this Handbook were formulated based on discussions with and requests from engineers involved in aerospace vehicle development and operations. Therefore, they represent responses to actual engineering problems and are not just a general compilation of environmental data. The Handbook addresses the basis for the information presented, the interpretations of the terrestrial environment guideline given in the Handbook, and its application to the development of aerospace vehicle design requirements. Specific examples of the Handbook content and associated 'lessons lenmed' are given in this paper.
Author
Aerospace Systems; Design Analysis; Propulsion System Performance; Spacecraft Launching; Aerospace Vehicles; Aerospace Engineering; Atmospheric Models

20080015431 NASA Langley Research Center, Hampton, VA, USA

Using the Bootstrap Method for a Statistical Significance Test of Differences between Summary Histograms

Xu, Kuan-Man; [2006]; 34 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF ATM-0336762; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015431

A new method is proposed to compare statistical differences between summary histograms, which are the histograms summed over a large ensemble of individual histograms. It consists of choosing a distance statistic for measuring the difference between summary histograms and using a bootstrap procedure to calculate the statistical significance level. Bootstrapping is an approach to statistical inference that makes few assumptions about the underlying probability distribution that describes the data. Three distance statistics are compared in this study. They are the Euclidean distance, the Jeffries-Matusita distance and the Kuiper distance. The data used in testing the bootstrap method are satellite measurements of cloud systems called cloud objects. Each cloud object is defined as a contiguous region/patch composed of individual footprints or fields of view. A histogram of measured values over footprints is generated for each parameter of each cloud object and then summary histograms are accumulated over all individual histograms in a given cloud-object size category. The results of statistical hypothesis tests using all three distances as test statistics are generally similar, indicating the validity of the proposed method. The Euclidean distance is determined to be most suitable after comparing the statistical tests of several parameters with distinct probability distributions among three cloud-object size categories. Impacts on the statistical significance levels resulting from differences in the total lengths of satellite footprint data between two size categories are also discussed.

Author

Euclidean Geometry; Histograms; Inference; Statistical Analysis; Probability Distribution Functions; Climate Models

20080015449 NASA Langley Research Center, Hampton, VA, USA

Doppler Lidar Observations of an Atmospheric Thermal Providing Lift to Soaring Ospreys

Koch, Grady J.; [2005]; 12 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015449

Vertical wind measurements are presented of an atmospheric thermal in which ospreys (Pandion haliaetus) were soaring. These observations were made with a Doppler lidar, allowing high spatial and high temporal resolution wind profiles in clear air. The thermal was generated at the onset of a cloud bank, producing a rolling eddy upon which ospreys were seen to be riding. A determination is made on the size and shape of the thermal, wind speeds involved, and the altitude to which the birds could have ridden the thermal.

Author

Birds; Doppler Radar; Wind Velocity Measurement; Soaring; Clouds (Meteorology); Vertical Air Currents

20080015497 National Inst. of Aerospace Associates, Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA

Cloud Properties Simulated by a Single-Column Model. Part II: Evaluation of Cumulus Detrainment and Ice-phase Microphysics Using a Cloud Resolving Model

Luo, Yali; Krueger, Steven K.; Xu, Kuan-Man; [2005]; 47 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): DEFG03-94ER61769; Copyright; Avail.: CASI: A03, Hardcopy

This paper is the second in a series in which kilometer-scale-resolving observations from the Atmospheric Radiation Measurement program and a cloud-resolving model (CRM) are used to evaluate the single-column model (SCM) version of the National Centers for Environmental Prediction Global Forecast System model. Part I demonstrated that kilometer-scale cirrus properties simulated by the SCM significantly differ from the cloud radar observations while the CRM simulation reproduced most of the cirrus properties as revealed by the observations. The present study describes an evaluation, through a comparison with the CRM, of the SCM's representation of detrainment from deep cumulus and ice-phase microphysics in an effort to better understand the findings of Part I. It is found that detrainment occurs too infrequently at a single level at a time in the SCM, although the detrainment rate averaged over the entire simulation period is somewhat comparable to that of the CRM simulation. Relatively too much detrained ice is sublimated when first detrained. Snow falls over too deep of a layer due to the assumption that snow source and sink terms exactly balance within one time step in the SCM. These characteristics in the SCM parameterizations may explain many of the differences in the cirrus properties between the SCM and the observations (or between the SCM and the CRM). A possible improvement for the SCM consists of the inclusion of multiple cumulus cloud types as in the original Arakawa-Schubert scheme, prognostically determining the stratiform cloud

fraction and snow mixing ratio. This would allow better representation of the detrainment from deep convection, better coupling of the volume of detrained air with cloud fraction, and better representation of snow field.
Author
Clouds (Meteorology); Cloud Physics; Ice Clouds; Atmospheric Models; Parameterization; Simulation

20080015503 Texas A&M Univ., College Station, TX, USA; NASA Langley Research Center, Hampton, VA, USA
The Influence of Thermodynamic Phase on the Retrieval of Mixed-Phase Cloud Microphysical and Optical Properties in the Visible and Near Infrared Region
Lee, Joonsuk; Yang, Ping; Dessler, Andrew E.; Baum, Bryan A.; Platnick, Steven; [2005]; 19 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GL24G; NSF ATM-0239605; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015503

Cloud microphysical and optical properties are inferred from the bidirectional reflectances simulated for a single-layered cloud consisting of an external mixture of ice particles and liquid droplets. The reflectances are calculated with a rigorous discrete ordinates radiative transfer model and are functions of the cloud effective particle size, the cloud optical thickness, and the values of the ice fraction in the cloud (i.e., the ratio of ice water content to total water content). In the present light scattering and radiative transfer simulations, the ice fraction is assumed to be vertically homogeneous; the habit (shape) percentage as a function of ice particle size is consistent with that used for the Moderate Resolution Imaging Spectroradiometer (MODIS) operational (Collection 4 and earlier) cloud products; and the surface is assumed to be Lambertian with an albedo of 0.03. Furthermore, error analyses pertaining to the inference of the effective particle sizes and optical thicknesses of mixed-phase clouds are performed. Errors are calculated with respect to the assumption of a cloud containing solely liquid or ice phase particles. The analyses suggest that the effective particle size inferred for a mixed-phase cloud can be underestimated (or overestimated) if pure liquid phase (or pure ice phase) is assumed for the cloud, whereas the corresponding cloud optical thickness can be overestimated (or underestimated).
Author
Ice Clouds; Cloud Physics; Moisture Content; Drops (Liquids); Bidirectional Reflectance; Optical Properties; Radiative Transfer; MODIS (Radiometry)

20080015511 NASA Langley Research Center, Hampton, VA, USA
The Atmospheric Radiation Measurement Program May 2003 Intensive Operations Period Examining Aerosol Properties and Radiative Influences: Preface to Special Section
Ferrare, Richard; Feingold, Graham; Ghan, Steven; Ogren, John; Schmid, Beat; Schwartz, Stephen E.; Sheridan, Pat; [2006]; 20 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DE-AC06-76RLO 1830; Copyright; Avail.: CASI: A03, Hardcopy

Atmospheric aerosols influence climate by scattering and absorbing radiation in clear air (direct effects) and by serving as cloud condensation nuclei, modifying the microphysical properties of clouds, influencing radiation and precipitation development (indirect effects). Much of present uncertainty in forcing of climate change is due to uncertainty in the relations between aerosol microphysical and optical properties and their radiative influences (direct effects) and between microphysical properties and their ability to serve as cloud condensation nuclei at given supersaturations (indirect effects). This paper introduces a special section that reports on a field campaign conducted at the Department of Energy Atmospheric Radiation Measurement site in North Central Oklahoma in May, 2003, examining these relations using in situ airborne measurements and surface-, airborne-, and space-based remote sensing.
Author
Radiation Measurement; Aerosols; Atmospheric Radiation; Climate Change; Remote Sensing; Condensation Nuclei; Optical Properties

20080015514 Texas A&M Univ., College Station, TX, USA; NASA Langley Research Center, Hampton, VA, USA
Potential Nighttime Contamination of CERES Clear-sky Field of View by Optically Thin Cirrus during the CRYSTAL-FACE Campaign
Lee, Yong-Keun; Yang, Ping; Hu, Yongxiang; Baum, Bryan A.; Loeb, Norman G.; Gao, Bo-Cai; January 2006; 36 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 4400053274; NNG04GL24G; NSF ATM-0239605; Copyright; Avail.: CASI: A03, Hardcopy

We investigate the outgoing broadband longwave (LW, 5 to approx. 200 microns) and window (WIN, 8 to approx. 12

microns) channel radiances at the top of atmosphere (TOA) under clear-sky conditions, using data acquired by the Cloud and the Earth s Radiant Energy System (CERES) and Moderate-Resolution Imaging Spectroradiometer (MODIS) instruments onboard the NASA Terra satellite platform. In this study, detailed analyses are performed on the CERES Single Scanner Footprint TOA/Surface Fluxes and Clouds product to understand the radiative effect of thin cirrus. The data are acquired over the Florida area during the Cirrus Regional Study of Tropical Anvils and Cirrus Layers Florida Area Cirrus Experiment (CRYSTAL-FACE) field program. Of particular interest is the anisotropy associated with the radiation field. Measured CERES broadband radiances are compared to those obtained from rigorous radiative transfer simulations. Analysis of results from this comparison indicates that the simulated radiances tend to be larger than their measured counterparts, with differences ranging from 2.1% to 8.3% for the LW band and from 1.7% to 10.6% for the WIN band. The averaged difference in radiance is approximately 4% for both the LW and WIN channels. A potential cause for the differences could be the presence of thin cirrus (i.e., optically thin ice clouds with visible optical thicknesses smaller than approximately 0.3). The detection and quantitative analysis of these thin cirrus clouds are challenging even with sophisticated multispectral instruments. While large differences in radiance between the CERES observations and the theoretical calculations are found, the corresponding difference in the anisotropic factors is very small (0.2%). Furthermore, sensitivity studies show that the influence due to a 1 K bias of the surface temperature on the errors of the LW and WIN channel radiances is of the same order as that associated with a 2% bias of the surface emissivity. The LW and WIN errors associated with a 5% bias of water vapor amount in the lower atmosphere in conjunction with a 50% bias of water vapor amount in the upper atmosphere is similar to that of a 1 K bias of the vertical temperature profile. Even with the uncertainties considered for these various factors, the simulated LW and WIN radiances are still larger than the observed radiances if thin cirrus clouds are excluded.
Author
Cirrus Clouds; Radiation Distribution; Crystal Field Theory; Upper Atmosphere; Water Vapor; Radiative Transfer; Quantitative Analysis; Emissivity; Broadband

20080015516 Hampton Univ., VA, USA; NASA Langley Research Center, Hampton, VA, USA
Seasonal and Interannual Variations of Top-of-Atmosphere Irradiance and Cloud Cover over Polar Regions Derived from the CERES Data Set
Kato, Seiji; Loeb, Norman G.; Minnis, Patrick; Francis, Jennifer A.; Charlock, Thomas P.; Rutan, David A.; Clothiaux, Eugene E.; Sun-Mack, Szedung; [2006]; 21 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The semi-direct effects of dust aerosols are analyzed over eastern Asia using 2 years (June 2002 to June 2004) of data from the Clouds and the Earth s Radiant Energy System (CERES) scanning radiometer and MODerate Resolution Imaging Spectroradiometer (MODIS) on the Aqua satellite, and 18 years (1984 to 2001) of International Satellite Cloud Climatology Project (ISCCP) data. The results show that the water path of dust-contaminated clouds is considerably smaller than that of dust-free clouds. The mean ice water path (IWP) and liquid water path (LWP) of dusty clouds are less than their dust-free counterparts by 23.7% and 49.8%, respectively. The long-term statistical relationship derived from ISCCP also confirms that there is significant negative correlation between dust storm index and ISCCP cloud water path. These results suggest that dust aerosols warm clouds, increase the evaporation of cloud droplets and further reduce cloud water path, the so-called semi-direct effect. The semi-direct effect may play a role in cloud development over arid and semi-arid areas of East Asia and contribute to the reduction of precipitation.
Author
Clouds (Meteorology); MODIS (Radiometry); Annual Variations; Climatology; Cloud Cover; Drops (Liquids); Dust Storms; Radiant Flux Density; Aerosols

20080015517 Brookhaven National Lab., Upton, NY, USA; NASA Langley Research Center, Hampton, VA, USA
Temporal Variation of Aerosol Properties at a Rural Continental Site and Study of Aerosol Evolution through Growth Law Analysis
Wang, Jian; Collins, Don; Covert, David; Elleman, Robert; Ferrare, Richard A.; Gasparini, Roberto; Jonsson, Haflidi; Ogren, John; Sheridan, Patrick; Tsay, Si-Chee; [2006]; 53 pp.; In English; Original contains color and black and white illustrations Contract(s)/Grant(s): DE-AC02-98CH10866; DE-AC06-76RL01830; Copyright; Avail.: CASI: A04, Hardcopy

Aerosol size distributions were measured by a Scanning Mobility Particle Sizer (SMPS) onboard the CIRPAS Twin Otter aircraft during 16 flights at the Southern Great Plains (SGP) site in northern central Oklahoma as part of the Aerosol Intensive Operation period in May, 2003. During the same period a second SMPS was deployed at a surface station and provided continuous measurements. Combined with trace gas measurements at the SGP site and back-trajectory analysis, the aerosol size distributions provided insights into the sources of aerosols observed at the SGP site. High particle concentrations,

observed mostly during daytime, were well correlated with the sulfur dioxide (SO2) mixing ratios, suggesting nucleation involving sulfuric acid is likely the main source of newly formed particles at the SGP. Aerosols within plumes originating from wildfires in Central America were measured at the surface site. Vertically compact aerosol layers, which can be traced back to forest fires in East Asia, were intercepted at altitudes over 3000 meters. Analyses of size dependent particle growth rates for four periods during which high cloud coverage was observed indicate growth dominated by volume controlled reactions. Sulfate accounts for 50% to 72% of the increase in aerosol volume concentration; the rest of the volume concentration increase was likely due to secondary organic species. The growth law analyses and meteorological conditions indicate that the sulfate was produced mainly through aqueous oxidation of SO2 in clouds droplets and hydrated aerosol particles.
Author
Atmospheric Composition; Aerosols; Drops (Liquids); Trajectory Analysis; Mixing Ratios; Gas Analysis; Temporal Distribution; Trace Contaminants

20080015519 Analytical Services and Materials, Inc., Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA
An Analytical Solution of Radiative Transfer in the Coupled Atmosphere-Ocean System with Rough Surface
Jin, Zhonghai; Charlock, Thomas P.; Rutledge, Ken; Knut Stamnes; Wang, Yingjian; [2006]; 30 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Using the efficient discrete-ordinate method, we present an analytical solution for radiative transfer in the coupled atmosphere-ocean system with rough air-water interface. The theoretical formulations of the radiative transfer equation and solution are described. The effects of surface roughness on radiation field in the atmosphere and ocean are studied and compared with measurements. The results show that ocean surface roughness has significant effects on the upwelling radiation in the atmosphere and the downwelling radiation in the ocean. As wind speed increases, the angular domain of sunglint broadens, the surface albedo decreases, and the transmission to ocean increases. The downward radiance field in the upper ocean is highly anisotropic, but this anisotropy decreases rapidly as surface wind increases and as depth in ocean increases. The effects of surface roughness on radiation also depend greatly on both wavelength and angle of incidence (i.e., solar elevation); these effects are significantly smaller throughout the spectrum at high sun. The model-observation discrepancies may indicate that the Cox-Munk surface roughness model is not sufficient for high wind conditions.
Author
Air Water Interactions; Surface Roughness Effects; Wind Velocity; Radiative Transfer; Ocean Surface; Ground Wind

20080015522 NASA Langley Research Center, Hampton, VA, USA
Calibration Technique for Polarization-Sensitive Lidars
Alvarez, J. M.; Vaughan, M. A.; Hostetler, C. A.; Hung, W. H.; Winker, D. M.; January 2006; 54 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A04, Hardcopy

Polarization-sensitive lidars have proven to be highly effective in discriminating between spherical and non-spherical particles in the atmosphere. These lidars use a linearly polarized laser and are equipped with a receiver that can separately measure the components of the return signal polarized parallel and perpendicular to the outgoing beam. In this work we describe a technique for calibrating polarization-sensitive lidars that was originally developed at NASA s Langley Research Center (LaRC) and has been used continually over the past fifteen years. The procedure uses a rotatable half-wave plate inserted into the optical path of the lidar receiver to introduce controlled amounts of polarization cross-talk into a sequence of atmospheric backscatter measurements. Solving the resulting system of nonlinear equations generates the system calibration constants (gain ratio, G, and offset angle, theta) required for deriving calibrated measurements of depolarization ratio from the lidar signals. In addition, this procedure also determines the mean depolarization ratio within the region of the atmosphere that is analyzed. Simulations and error propagation studies show the method to be both reliable and well behaved. Operational details of the technique are illustrated using measurements obtained as part of Langley Research Center s participation in the First ISCCP Regional Experiment (FIRE).
Author
Clouds (Meteorology); Climatology; Depolarization; Satellite Observation; Optical Radar; Backscattering; Calibrating

20080015569 National Oceanic and Atmospheric Administration, Camp Springs, MD, USA
A Closer Look at the Congo and the Lightning Maximum on Earth
Blakeslee, R. J.; Buechler, D. E.; Lavreau, Johan; Goodman, Steven J.; February 04, 2008; 1 pp.; In English; 3rd International TRMM Science Conference/NASA, 4-8 Feb. 2008, Las Vegas, NV, USA; Copyright; Avail.: Other Sources; Abstract Only

The global maps of maximum mean annual flash density derived from a decade of observations from the Lightning

Imaging Sensor on the NASA Tropical Rainfall Measuring Mission (TRMM) satellite show that a 0.5 degree x 0.5 degree pixel west of Bukavu, Democratic Republic of Congo (latitude 2S, longitude 28E) has the most frequent lightning activity anywhere on earth with an average value in excess of 157 fl/sq km/yr. This pixel has a flash density that is much greater than even its surrounding neighbors. By contrast the maximum mean annual flash rate for North America located in central Florida is only 33 fl/sq km/yr. Previous studies have shown that monthly-seasonal-annual lightning maxima on earth occur in regions dominated by coastal (land-sea breeze interactions) or topographic influences (elevated heat sources, enhanced convergence). Using TRMM, Landsat Enhanced Thematic Mapper, and Shuttle Imaging Radar imagery we further examine the unique features of this region situated in the deep tropics and dominated by a complex topography having numerous mountain ridges and valleys to better understand why this pixel, unlike any other, has the most active lightning on the planet.
Author
Thematic Mappers (Landsat); TRMM Satellite; Lightning; Democratic Republic of Congo; Imaging Techniques; Landsat Satellites

20080015630 Lanzhou Univ., China; NASA Langley Research Center, Hampton, VA, USA
Satellite-Based Assessment of Possible Dust Aerosols Semi-Direct Effect on Cloud Water Path over East Asia
Huang, Jianping; Lin, Bing; Minnis, Patrick; Wang, Tainhe; Wang, Xin; Hu, Yongxiang; Yi, Yuhong; Ayers, J. Kirk; [2006]; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 2006CB400501; Copyright; Avail.: CASI: A03, Hardcopy

The semi-direct effects of dust aerosols are analyzed over eastern Asia using 2 years (June 2002 to June 2004) of data from the Clouds and the Earth s Radiant Energy System (CERES) scanning radiometer and MODerate Resolution Imaging Spectroradiometer (MODIS) on the Aqua satellite, and 18 years (1984 to 2001) of International Satellite Cloud Climatology Project (ISCCP) data. The results show that the water path of dust-contaminated clouds is considerably smaller than that of dust-free clouds. The mean ice water path (IWP) and liquid water path (LWP) of dusty clouds are less than their dust-free counterparts by 23.7% and 49.8%, respectively. The long-term statistical relationship derived from ISCCP also confirms that there is significant negative correlation between dust storm index and ISCCP cloud water path. These results suggest that dust aerosols warm clouds, increase the evaporation of cloud droplets and further reduce cloud water path, the so-called semi-direct effect. The semi-direct effect may play a role in cloud development over arid and semi-arid areas of East Asia and contribute to the reduction of precipitation.
Author
Aerosols; Clouds (Meteorology); Dust Storms; MODIS (Radiometry); Radiant Flux Density; Satellite Observation; Contamination; Drops (Liquids)

20080015648 NASA Marshall Space Flight Center, Huntsville, AL, USA
Relationships Between TRMM Precipitation and Upper-Tropospheric Hydrometeors as Seen From AMSU-B/MHS and A-Train Sensors
Robertson, Franklin; Pittman, Jasna; Atkinson, Robert; February 04, 2008; 1 pp.; In English; TRMM Meeting, 4-8 Feb. 2008, Las Vegas, NV, USA; Copyright; Avail.: Other Sources; Abstract Only

Tropical rainfall as seen by the TRMM radar has multiple scales of organization, one prominent example of which is mesoscale deep convection that supports the production of strong, widespread anvil systems important to the planet's water and energy balance. TRMM PR precipitation retrievals (i.e. the 2A25 algorithm) are reliable down to rates below 1.0 mm/h which captures the majority of near-surface rainfall. However, much of the precipitating hydrometeor mass above the freezing level in these anvil systems may be associated with particles where TRMM PR s/n is low. In our analysis we are examining the question of 'What portions of the total hydrometeor spectrum can we see individually with TRMM, CloudSat, high frequency passive microwave (e.g. AMSU-B, MHS) and MODIS'. This will allow us to pursue fundamental issues of precipitation efficiency, maintenance of upper-tropospheric humidity, and cloud forcing variability in the tropical climate system. We do this by generating frequency distributions of ice water content (IWC), integrated IWC (IWP), and precipitation as appropriate for these sensors and relate these to TRMM near-surface rainfall. Joint frequency distributions are developed from more limited coincidence between TRMM and these sensors. We interpret these results in terms of a climate regime descriptor and as an index of precipitation efficiency for tropical rain systems.
Author
Tropical Regions; Rain; TRMM Satellite; Mesoscale Phenomena; Convection; Water Balance; Energy Budgets; Moisture Content; Climate; CloudSat

20080015649 NASA Marshall Space Flight Center, Huntsville, AL, USA

Using Wind and Temperature Fields to Study Dehydration Mechanisms in the Tropical Tropopause Layer

Pittman, Jasna; Miller, Timothy; Robertson, Franklin; January 28, 2008; 1 pp.; In English; 3rd International Conference on Reanalysis, 28 Jan.-1 Feb. 2008, Tokyo, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The tropics are the main region for troposphere-to-stratosphere transport (TST) of air. One of the dominant mechanisms that control tropical TST of water vapor is freeze-drying by the cold tropical tropopause. This mechanism is supported by evidence from satellite observations of the 'tape recorder', where seasonal changes in stratospheric water vapor are in phase with seasonal changes in tropopause temperatures in the tropics. Over the last few years, however, the concept of the tropical tropopause has evolved from a single material surface to a layer called the Tropical Tropopause Layer (TTL). A recent hypothesis on dehydration mechanisms suggests that dehydration and entry point into the stratosphere are not always co-located (Holton and Gettelman, 2001). Instead, dehydration can occur during horizontal advection through Lagrangian 'cold pools', or coldest regions along a parcel's trajectory, as air ascends within the TTL while the entry point into the stratosphere occurs at a different geographical location. In this study, we investigate the impact that these Lagrangian cold pools have on TTL moisture. For this purpose, we use in situ measurements of TTL water vapor obtained aboard NASA's WB-57 aircraft over the Eastern Tropical Pacific, and we compare these measurements to minimum saturation water vapor mixing ratios obtained from three-dimensional backward trajectory calculations. Aircraft measurements show frequent unsaturated conditions, which suggest that the entry value of stratospheric water vapor in this region was not set by local saturation conditions. Trajectory calculations, driven by both ECMWF operational analysis and reanalysis winds and temperature fields, are used to explore the impact (e.g., geographical location, timing, dehydration magnitude) of the Lagrangian cold pools intercepted by the parcels sampled by the aircraft. We find noteworthy differences in the location of the Lagrangian cold pools using the two ECMWF data sets, namely influence of the Western Tropical Pacific region when using operational analysis fields versus influence of the Eastern Tropical Pacific and South America regions when using reanalysis fields. These results have a significant impact on our scientific conclusions on dehydration mechanisms affecting the air sampled by the aircraft, given that these regions have different thermodynamic and convective properties.

Author

Tropical Regions; Water Vapor; Troposphere; Stratosphere; Temperature Distribution; Tropopause; Dehydration; Freeze Drying; Annual Variations

20080015664 Analytical Services and Materials, Inc., Hampton, VA, USA; NASA Langley Research Center, Hampton, VA, USA

Offshore Radiation Observations for Climate Research at the CERES Ocean Validation Experiment

Rutledge, Charles K.; Schuster, Gregory L.; Charlock, Thomas P.; Denn, Frederick M.; Smith, William L., Jr.; Fabbri, Bryan E.; Madigan, James J., Jr.; Knapp, Robert J.; [2006]; 45 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

When radiometers on a satellite are pointed towards the planet with the goal of understanding a phenomenon quantitatively, rather than just creating a pleasing image, the task at hand is often problematic. The signal at the detector can be affected by scattering, absorption, and emission; and these can be due to atmospheric constituents (gases, clouds, and aerosols), the earth's surface, and subsurface features. When targeting surface phenomena, the remote sensing algorithm needs to account for the radiation associated with the atmospheric constituents. Likewise, one needs to correct for the radiation leaving the surface, when atmospheric phenomena are of interest. Rigorous validation of such remote sensing products is a real challenge. In visible and near infrared wavelengths, the jumble of effects on atmospheric radiation are best accomplished over dark surfaces with fairly uniform reflective properties (spatial homogeneity) in the satellite instrument's field of view (FOV). The ocean's surface meets this criteria; land surfaces - which are brighter, more spatially inhomogeneous, and more changeable with time - generally do not. NASA's Clouds and the Earth's Radiant Energy System (CERES) project has used this backdrop to establish a radiation monitoring site in Virginia's coastal Atlantic Ocean. The project, called the CERES Ocean Validation Experiment (COVE), is located on a rigid ocean platform allowing the accurate measurement of radiation parameters that require precise leveling and pointing unavailable from ships or buoys. The COVE site is an optimal location for verifying radiative transfer models and remote sensing algorithms used in climate research; because of the platform's small size, there are no island wake effects; and suites of sensors can be simultaneously trained both on the sky and directly on ocean itself. This paper describes the site, the types of measurements made, multiple years of atmospheric and ocean surface radiation observations, and satellite validation results.

Author

Climatology; Atmospheric Radiation; Radiation Measurement; Radiative Transfer; Remote Sensing; Ocean Surface; CERES (Experiment); Satellite Observation

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20080015475 Shanghai Astronomical Observatory, China

GloBal Sealevel Change from 1992 to 2007

MA, Jin; ZHOU, Yong-hong; LIAO, De-chun; LIAO, Xin-hao; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 37-41; In English; See also 20080015458; Copyright; Avail.: Other Sources

There are many factors that cause the temporal and spacial change of the global sea level, such as the atmospheric pressure, wind, ocean current and seawater density. Among these factors, the sea surface temperature is the main source that changes the sea level. The global sea level rise from October 1993 to January 2007 is calculated based on the sea level anomalies data provided by the Archiving, Validation and Interpretation of Satellite Oceanographic data (AVISO) , and the spacial distribution of the sea level rise is also obtained. The correlation of the sea surface temperature and the sea level change is analyzed by comparing the Optimum Interpolation Sea Surface Temperature (OISST) data derived from National Oceanic and Atmospheric Administration (NOAA) with the sea level anomalies data.

Author

Sea Level; Sea Surface Temperature; Atmospheric Pressure; Current Density; Ocean Currents; Oceanographic Parameters

20080015513 Joint Research Centre of the European Communities, Ispra, Italy

A Network for Standardized Ocean Color Validation Measurements

Zibordi, Giuseppe; Holben, Brent; Hooker, Stanford; Melin, Frederic; Berthon, Jean-Francois; Slutsker, Ilya; Giles, David; Vandemark, Doug; Feng, Hui; Rutledge, Ken; Schuster, Gregory; Al Mandoos, Abdulla; [2006]; 13 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Aerosol Robotic Network (AERONET) was developed to support atmospheric studies at various scales with measurements from worldwide distributed autonomous sunphotometers [Holben et al. 1998]. AERONET has now extended its support to marine applications through the additional capability of measuring the radiance emerging from the sea with modified sun-photometers installed on offshore platforms like lighthouses, navigation aids, oceanographic and oil towers. The functionality of this added network component called AERONET - Ocean Color (AERONET-OC), has been verified at different sites and deployment structures over a four year testing phase. Continuous or occasional deployment platforms (see Fig. 1) included: the Acqua Alta Oceanographic Tower (AAOT) of the Italian National Research Council in the northern Adriatic Sea since spring 2002; the Martha s Vineyard Coastal Observatory (MVCO) tower of the Woods Hole Oceanographic Institution in the Atlantic off the Massachusetts coast for different periods since spring 2004; the TOTAL Abu-Al-Bukhoosh oil Platform (AABP, shown through an artistic rendition in Fig. 1) in the Persian (Arabian) Gulf in fall 2004; the Gustaf Dal n Lighthouse Tower (GDLT) of the Swedish Maritime Administration in the Baltic Sea in summer 2005; and the platform at the Clouds and the Earth's Radiant Energy System (CERES) Ocean Validation Experiment (COVE) site located in the Atlantic Ocean off the Virginia coast since fall 2005. Data collected during the network testing phase, confirm the capability of AERONET-OC to support the validation of marine optical remote sensing products through standardized measurements of normalized water-leaving radiance, LWN, and aerosol optical thickness, a, at multiple coastal sites.

Author

Oceanography; Aerosols; Marine Technology; Remote Sensing; Water Color

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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*.

20080014288 NASA Johnson Space Center, Houston, TX, USA

Radio-sensitization of Prostate Cancer Cells by Monensin Treatment and its associated Gene Expression Profiling Changes

Zhang Ye; Rohde, Larry H.; Wu, Honglu; [2008]; 1 pp.; In English; 54th Annual Meeting of the Radiation Research Society, 21-25 Sep. 2008, Boston, MA, USA; Copyright; Avail.: Other Sources; Abstract Only

Radio-resistant or recurrent prostate cancer represents a serious health risk for approximately 20%-30% of patients treated

with primary radiation therapy for clinically localized prostate cancer. Here, we investigated the effect of monensin on sensitizing radiation mediated cell killing of two radio-resistant prostate cell lines Lncap (P53+ and AR+) and PC3 (P53- and AR-). Treatment with monensin alone (5 micromoles-20 micromoles) showed a significant direct cell killing of Lncap (10-30%), but not PC3 cells. Monensin was also shown to successfully sensitize Lncap cells to X-ray radiation (2Gy-10Gy) mediated cell death, up to 50% of killing with the combined treatment. To better understand the mechanisms of radio-resistance of these two cell lines and their different response to monensin, the apoptosis related gene expression profiles in both cell lines were analyzed using cDNA PCR array. Without any treatment, PC3 showed a much higher expression level of antiapoptosis genes than Lncap in the BCL2 family, the caspase/card family and the TNF ligand/receptor family. At 2 hr after 20 micormolar monensin treatment alone, only the TRAF and CIDE family showed a greater induction in Lncap cells than in PC3. Exposures to 10 Gy X-rays alone of Lncap cells significantly induced gene expression levels in the death and death receptor domain family, the TNF ligand and receptor family, and apoptotic group of BCL2 family; whereas exposures of PC3 induced only the expression of genes in the anti-apoptosis group of CASP and CARD family. Furthermore, we selectively suppressed the expression of several anti-apoptosis genes (BCL-xl, Bcl2A1, BIRC2, BIRC3 and CASP2) in PC3 cells by using the siRNA treatment. Exposure to 10Gy X-rays alone showed an enhanced cell killing (about 15%) in BCL-x1 silenced cells, but not in cells with siRNA treatment targeting other anti-apoptosis genes. We also exposed PC3 cells to protons in the Bragg peak region to compare the effectiveness of cell killing of X-rays. Interestingly, in comparison to X-rays, protons significantly reduced the gene expression in the anti-apoptosis family, suggesting that proton treatment may be more effective for PC3 cells. As a conclusion, monensin was found to sensitize Lncap cells, but not PC3, and over-expression of Bcl-xl cells may be responsible for the radio- or chemo-resistance characteristics of PC3 cells.
Author
Cancer; Prostate Gland; Sensitizing; Gene Expression; Health Physics; Radiation Tolerance

20080014390 Armed Forces Radiobiology Research Inst., Bethesda, MD USA
Combination Therapy for Radiation-Induced Bone Marrow Aplasia in Nonhuman Primates Using Synthokine SC-55494 and Recombinant Human Granulocyte Colony-Stimulating Factor
MacVittle, Thomas J; Farese, Ann M; Herodin, Francis; Grab, Lisa B; Baum, Charles M; McKearn, John P; May 15, 1996; 8 pp.; In English
Report No.(s): AD-A475660; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475660

Combination cytokine therapy continues to be evaluated in an effort to stimulate multilineage hematopoietic reconstitution after bone marrow myelosuppression. This study evalu- ated the efficacy of combination therapy with the synthetic interleukin-3 receptor agonist, Synthokine-SC55494, and recombinant methionyl human granulocyte colony-stimulating factor (rhG-CSF) on platelet and neutrophil recovery in nonhuman primates exposed to total body 700 cGy 60Co gamma radiation. After irradiation on day (d) 0, cohorts of animals subcutaneously received single-agent protocols of either human serum albumin (HSA; every day [OD], 15 microng/kg/d. n = 10). Synthokine (twice daily [BID], 100 microng/kg/d, n = 5), rhG-CSF (QD, 10 microng/kg/d, n = 5). or a combination of Synthokine and rhG-CSF (BID, 100 and 10 microng/kg/d, respectively, n = 5) for 23 days beginning on dl. Complete blood counts were monitored for 60 days postirradiation and the durations of neutropenia (absolute neutrophil count <500/micron Liter) and thrombocytopenia (platelet count <20,00O/micron Liter) were assessed. Animals were provided clinical support in the form of antibiotics, fresh irradiated whole blood, and fluids. All cytokine protocols significantly (P < .05) reduced the duration of thrombocytopenia versus the HSA-treated animals. Only the combination protocol of Synthokine + rhG-CSF and rhG-CSF alone significantly shortened the period of neutropenia (P < .05). The combined SynthokinelrhG-CSF protocol significantly improved platelet nadir versus Synthokine alone and HSA controls and neutrophil nadir versus rhG-CSF alone and HSA controls. All cytokine protocols decreased the time to recovery to preirradiation neutrophil and platelet values. The SynthokinelrhG-CSF protocol also reduced the transfusion requirements per treatment group to 0 among 5 animals as compared with 2 among 5 animalsfor Synthokine alone, 8 among 5 animals for rhG-CSF, and 17 among 10 animals for HSA.
DTIC
Biometrics; Blood; Bone Marrow; Clinical Medicine; Colonies; Leukocytes; Platelets; Primates; Radiation Effects; Stimulation; Therapy

20080014391 Armed Forces Radiobiology Research Inst., Bethesda, MD USA

Medical Managment of the Acute Radiation Syndrome: Recommendations of the Strategic National Stockpile Radiation Working Group

Waselenka, Jamie K; MacVittie, Thomas J; Blakely, William F; Pesik, Nicki; Wiley, Albert L; Dickerson, William E; Tsu, Horace; Confer, Dennis L; Coleman, Norman; Seed, Thomas; Jun 15, 2004; 20 pp.; In English

Report No.(s): AD-A475661; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475661

Physicians, hospitals, and other health care facilities will assume the responsibility for aiding individuals injured by a terrorist act involving radioactive material. Scenarios have been developed for such acts that include a range of exposures resulting in few to many casualties. This consensus document was developed by the Strategic National Stockpile Radiation Working Group to provide a framework for physicians in internal medicine and the medical subspecialties to evaluate and manage large-scale radiation injuries. Individual radiation dose is assessed by determining the time to onset and severity of nausea and vomiting, decline in absolute lymphocyte count over several hours or days after exposure, and appearance of chromosome aberrations (including dicentrics and ring forms) in peripheral blood lymphocytes. Documentation of clinical signs and symptoms (affecting the hematopoietic, gastrointestinal, cerebrovascular, and cutaneous systems) over time is essential for triage of victims, selection of therapy, and assignment of prognosis. Recommendations based on radiation dose and physiologic response are made for treatment of the hematopoietic syndrome. Therapy includes treatment with hematopoietic cytokines; blood transfusion; and, in selected cases, stem-cell transplantation. Additional medical management based on the evolution of clinical signs and symptoms includes the use of antimicrobial agents (quinolones, antiviral therapy, and antifungal agents), antiemetic agents, and analgesic agents. Because of the strong psychological impact of a possible radiation exposure, psychosocial support will be required for those exposed, regardless of the dose, as well as for family and friends. Treatment of pregnant women must account for risk to the fetus. For terrorist or accidental events involving exposure to radioiodines, prophylaxis against malignant disease of the thyroid is also recommended, particularly for children and adolescents.

DTIC

Health; Hospitals; Medical Services; Radiation Injuries; Radiation Sickness; Stockpiling

20080014394 International Brain Mapping, West Hollywood, CA USA

2007 International Brain Mapping and Intraoperative Surgical Planning Society's (IBMISPS) Annual World Congress

Kateb, Babak; Feb 1, 2008; 976 pp.; In English

Contract(s)/Grant(s): W81XH-07-1-0658

Report No.(s): AD-A475697; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475697

The third annual meeting of International Brain Mapping & Intra-operative Surgical Planning Society (IBMISPS) was held in Washington D:www.IBMISPS.Org. The Society is organized for the purpose of encouraging leading basic and clinical scientists who are interested or active in areas of Brain Mapping (BM) and intra-operative Surgical planning (ISP) to share their findings with other physicians and scientists across the disciplines. Currently, there is no combined conference on both subjects. This meeting intends to build a bridge between the two fields. The meeting has been organized by the board of directors and who will form the organizing committees: Search, Medical Education Committee, Program and Finance in collaboration with the local organizing committee who are listed on the program. The event did have significant clinical and basic science components. Thus, it was a multidisciplinary venue to explore and clarify a defined subject, problem, or area of knowledge related to BM and ISP with leaders in the field. The 5th annual meeting of IBMISPS is set for Aug 26-30, 2008 in Pasadena, CA. IBMISPS is also intended for the purpose of promoting the public welfare through the advancement of Intraoperative Surgical Planning and Brain Mapping, by a commitment to excellence in education, and by dedication to research and scientific discovery. The mission of the association will be achieved through a multi-disciplinary collaboration of government agencies, patient advocacy groups, educational institutes and private sector (industry) brought together in order to address issues and problems related to BM and ISP and implement new technologies to benefit patient care. We had specific scientific sessions on ranging from Image Guided Surgery, OR and Hospital of the future to nanomedicine & stem cell imaging ;All talks and abstracts that are presented at the meeting

DTIC

Brain; Surgery

20080014395 RAND Corp., Santa Monica, CA USA
Maintaining Military Medical Skills During Peacetime: Outlining and Assessing a New Approach
Eibner, Christine; Jan 2008; 58 pp.; In English
Contract(s)/Grant(s): W74V8H-06-C-0002
Report No.(s): AD-A475700; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475700

This monograph examines the feasibility of a new model for maintaining the clinical skills of the military medical force. Under the model, active-duty personnel would be assigned to civilian settings during peacetime. The study on which this monograph is based explored the feasibility of this model from a civilian perspective, focusing on civilian receptiveness to the proposed arrangement and identifying potential barriers and concerns. The study found that civilian medical organizations are generally receptive to the idea of such a model and that DoD could consider conducting a pilot study to assess the effectiveness of the model in improving military medical readiness.
DTIC
Health; Manpower; Medical Personnel; Military Personnel; Organizations

20080014399 Karolinska Inst., Stockholm, Sweden
A Novel Approach to Detect Therapeutic Resistance in Breast Cancer
Czene, Kamila; Sep 1, 2007; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0638
Report No.(s): AD-A475719; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475719

Purpose/scope: Our aim is to understand whether adjuvant therapy of a first primary breast cancer might predict the prognosis of a metachronous bilateral cancer. Major findings: Our findings support a selection process where adjuvant systemic treatment selectively prevents the occurrence of cancers with a favourable prognosis, allowing those with a more aggressive phenotype to surface clinically. Up-to- date report: We have requested for a no-cost extension of the project due to difficulties with collection of tissue samples.
DTIC
Breast; Cancer; Mammary Glands; Therapy

20080014403 Washington Univ., Seattle, WA USA
The Impact of Breast Cancer on Adolescent Function
Lewis, Frances M; Jul 1, 2007; 21 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0577
Report No.(s): AD-A475734; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475734

The primary aim of this study was to test a theoretically derived predictive model of adolescent functioning to maternal breast cancer. Standardized questionnaires with well-established validity and reliability were used to measure 6 theoretical concepts in the model and were obtained from 222 study participants, including mothers recently diagnosed with breast cancer, their spouse, and their adolescent child. Results from tests of the theoretical model revealed that the adolescent was deleteriously impacted under two conditions: when the mother's mood was more depressive or when there was heightened tension between the parents. Both heightened marital tension and maternal depressed mood deleteriously affected adolescents' self-esteem. However, the quality of parenting was a protective factor that significantly improved children's self-esteem and enhanced their behavioral-emotional functioning. Results argue for programs and services to help both the ill and non-ill parent sustain quality parenting of the adolescent during the first year of diagnosis, treatment, and early recovery from the mother's breast cancer.
DTIC
Breast; Cancer; Emotions; Human Beings; Mammary Glands

20080014404 State Univ. of New York at Buffalo, Amherst, NY USA
Anti-Inflammatory Cytokine IL-10 and Mammary Gland Development
Kuo, Shiu-Ming; Sep 2007; 4 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0645
Report No.(s): AD-A475735; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475735

This investigation seeks to determine the relationship between anti-inflammatory cytokine IL-10 and mammary gland

development. To achieve this goal, the authors propose to compare mammary glands from wild type and IL-10 knockout female mice at different stages of development: at day 21, day 55, day 80, day 150, and 2 days after giving birth. There are two major tasks: to breed and raise wild type and IL-10 knockout female mice by mating IL-10 heterozygous females with IL-10 heterozygous males, and to develop essential techniques for mammary gland analysis so that they can compare mammary glands at the different stages of development. The University of Buffalo lab animal specific pathogen-free facility (where the experimental mice are housed) went through a major renovation in the summer/fall of 2006, and through a major reorganization of animal care in Feb-May of 2007. Since then, the authors have started the intensive breeding required for the project. Of the 110 female mice that are needed for various life stages in the study, they now have 20. Breeding and PCR genotyping are being carried out continuously to generate the remaining experimental mice. The authors have established all the techniques that are needed for mammary gland analysis, including laboratory protocols for whole mount preparation and the preparation of paraffin sections of mammary gland. As soon as the experimental mice reach the desired age, which varies from 21 days to 150 days, they will begin preparing and analyzing their mammary glands.
DTIC
Histology; Mammary Glands; Mice; Pathology

20080014405 Arizona Univ., Tucson, AZ USA
Molecular Targeting of the PI3K/Akt Pathway to Prevent the Development of Hormone Resistant Prostate Cancer
Walker, Jonathan; Feb 2007; 5 pp.; In English
Contract(s)/Grant(s): W81XWH-05-1-0187
Report No.(s): AD-A475736; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475736

Recently, the PI3K/Akt pathway has been found to be a significant factor in the development and progression of prostate cancer. It is the authors' belief that the PI3K/Akt pathway is the critical pathway that is maintaining survival by blocking apoptosis in the absence of hormonal stimulation. They will use molecular targeting to inhibit the phosphorylation of Akt. Celecoxib is a FDA approved COX-2 inhibitor. What is unique to celecoxib is its ability to inhibit the phosphorylation of Akt. This effectively turns off the PI3k/Akt pathway leading to apoptosis. Celecoxib has been shown to induce apoptosis in a number of different malignancies. Unfortunately, the half maximal inhibitory concentration (IC(sub 50)) of celecoxib is less than is usually obtainable clinically. Therefore, in an attempt to improve upon Akt activity and decrease the IC(sub 50) concentration to clinically obtainable levels, Chin et al. synthesized multiple 2nd and 3rd generation compounds. These newer compounds have significantly lower IC(sub 50) levels, thus, therapeutic levels can be obtained clinically. The authors will use celecoxib and these newer compounds to evaluate the effects of combined PI3K/Akt inhibition and androgen ablation.
DTIC
Cancer; Enzymes; Hormones; Males; Molecular Biology; Prostate Gland; Target Acquisition; Tumors

20080014407 Florida International Univ., Miami, FL USA
Inhibition of Estrogen-Induced Growth of Breast Cancer by Targeting Mitrochondrial Oxidants
Roy, Deodutta; Felty, Quentin; Kunke, Brian; Apr 2007; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0468
Report No.(s): AD-A475741; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475741

We have completed proposed research in the First Year Task (i) both antioxidants, N-acetylcysteine and ebselen, overexpression of ROS lowering genes, such as, catalase or mtSOD; and silencing of mtTFA are able to induce cell growth arrest in the presence of estrogen by analysis of the expression of early cell cycle biomarkers, cyclin D1 and PCNA and a part of Second Year Task (iii) estrogen-induced cell transformation experiments determined by: (a) Foci Formation, (b) Anchorage-independent (soft agar) cell growth showed that estrogen-induced conversion of normal cells to transformed cells is inhibited by treatment with N-acetylcysteine and ebselen, overexpression of MnSOD or catalase; or mtTFA silencing. Our study revealed: i) Inhibition of ROS formation or detoxification of ROS prevented estrogen-induced DNA synthesis. ii). Both antoxidant treatment and detoxification of ROS prevented E2-induced expression of cyclin D1 and pcna. iii) E2 dependent anchorage-independent growth of MCF-10A cells is dependent on ROS and is prevented by overexpression of MnSOD, catalase, or mtTFA silencing. These findings suggest that, in addition to the receptor activity of estrogens, other factor(s) are involved in the stimulation of cell growth by estrogen. Our data suggest that estrogen regulates cell cycle genes through ROS. In addition to, existing antiestrogens and antiaromatse inhibitors, validation of our novel concept that defines estrogen-induced mtROS-dependent signaling pathways that distinguish between cell transformation and tumor cell growth will help to develop

antioxidant-based drug or gene therapies for the prevention and treatment of estrogen-dependent breast cancer.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Oxidizers

20080014411 Mayo Clinic, Jacksonville, FL USA
Identification of Serine Proteinases Involved in Breast Cancer Progression
Radisky, Evette; Sep 1, 2007; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0605
Report No.(s): AD-A475755; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475755

The objective of the grant was to identify serine proteinases (a) upregulated in malignant breast epithelial T4-2 cells, and (b) for which specific inhibition by RNA interference (RNAi) results in suppression of the malignant phenotype, as assessed in three-dimensional culture assays. We successfully identified five serine proteinases significantly upregulated in T4-2 cells: mesotrypsin, prostasin, transmembrane protease serine 3 (TMPRSS3), neurotrypsin, and matriptase-1. Among these, inhibition of mesotrypsin expression in T4-2 cells by RNAi leads to a significant reduction in colony size in 3D culture, implicating mesotrypsin activity in the T4-2 cell malignant growth phenotype, and identifying mesotrypsin as an oncogenic serine proteinase and a potential therapeutic target.
DTIC
Breast; Cancer; Mammary Glands; Ribonucleic Acids

20080014412 Texas Univ., Dallas, TX USA
Analysis of Morphogenic Effect of hDAB2IP on Prostate Cancer and its Disease Correlation
Hsieh, Jer-Tsong; Feb 2007; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0222; DAMD17-03-2-0033
Report No.(s): AD-A475757; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475757

Imbalance of apoptotic and/or survival signaling cascade is a hallmark of malignant cell. In prostate cancer (PCa), constitutive activation of phosphatidylinositol 3-kinase (PI3K)-Akt/PKB and inactivation of apoptosis-stimulated kinase (ASK1)-JNK pathway signaling are often detected in metastatic cell. Understanding the underlying mechanism leading to such alternations will provide a better treatment strategy to control the terminal stage of this disease. In this project, we have proposed that DAB2IP protein, a novel RASGAP, is a part of homeostatic machinery and plays an important in modulating signal pathways elicited by exogenous survival/death stimuli. Our data clearly demonstrated that DAB2IP is a novel scaffold protein that complexes with key proteins involved in cell growth or death. The outcome of this study has led us to unveil a new mechanism of DAB2IP, which provides a better understanding how PCa cells switch from survival to death under the stimuli of exogenous signals.
DTIC
Apoptosis; Cancer; Diseases; Prostate Gland

20080014415 Fox Chase Cancer Center, Philadelphia, PA USA
A New Therapeutic Paradigm for Breast Cancer Exploiting Low Dose Estrogen-Induce Apoptosis
Jordan,, Virgil C; Sep 2007; 302 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0590
Report No.(s): AD-A475768; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475768

To discover the mechanism of estrogen induced breast cancer cell apoptosis and establish the clinical value of short-term low dose estrogen treatment to cause apoptosis in antihormone resistance breast cancer. To achieve the goal, we have created an optimal collaborative network to study laboratory models of the regulation of estrogen-induced growth and apoptosis in breast cancer. The molecular mechanisms of estrogen action (ER) mediated regulation are being deciphered by the systematic distribution of processed tissues from the Fox Chase Cancer Center (FCCC) to Translational Genomics (TGen) for genomics (siRNA analysis, CGH, and Agilent gene array) and to Georgetown University (GU) for proteomic analysis. All derived data is being loaded on a secure website for analysis. A complimentary clinical trial is positioned to evaluate the antitumor effects of high dose estradiol (30 mg daily) in patients following the success and failure of two consecutive antihormonal therapies.

We have already discovered new estrogen regulated growth mechanisms and a new secreted protein, CEACAM-6 in estrogen-deprived breast cancer cells that enhances tumor invasions.
DTIC
Apoptosis; Breast; Cancer; Dosage; Estrogens; Mammary Glands; Therapy

20080014418 Georgetown Univ., Washington, DC USA
ERR Gamma: Does an Orphan Nuclear Receptor Link Steroid Hormone Biogenesis to Endocrine Resistance?
Riggins, Rebecca B; Sep 1, 2007; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0740
Report No.(s): AD-A475778; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475778

Estrogen-related receptor gamma (ERR gamma) is an orphan nuclear receptor with structural similarities to ER alpha and ER beta (1). In addition to its ability to transactivate classical and imperfect estrogen response elements (EREs) ERR gamma is a potent activator of transcription from steroidogenic factor-1 (SF-1) response elements (SF-1REs). Many genes regulated by SF-1REs control key aspects of cholesterol and fatty acid synthesis important not only for generation of the plasma membrane but also for the synthesis of steroid hormones (2). In this study we have investigated whether ERRy expression andlor activity regulates the level of cholesterol in a pair of breast cancer cell lines - one sensitive to endocrine therapy (SUM44) and the other resistant to endocrine therapy (LCCTam TAM). We found that endocrine-resistant LCCTam (TAM) cells which overexpress the orphan nuclear receptor ERR gamma contain significantly greater levels of cholesterol than endocrine-sensitive parental SUM44 breast cancer cells and that siRNA-mediated knockdown of ERRy in the resistant TAM cell line significantly reduces cholesterol content. SF-1RE activity is 34old higher in TAM cells as compared to SUM44 cells while expression of an endogenous gene (HMGCS2) that contains a consensus SF-1RE is also significantly overexpressed in TAM cells relative to SUM44 cells. Together these findings represent an important enhancement in our knowledge of breast cancer biology and potential therapeutic response.
DTIC
Biological Evolution; Breast; Cancer; Endocrinology; Estrogens; Hormones; Mammary Glands; Steroids

20080014421 Florida Univ., Gainesville, FL USA
Angiogenesis and Therapeutic Approaches to NF1 Tumors
Muir, David F; Apr 2007; 58 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0224
Report No.(s): AD-A475785; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475785

The goal of this project is to specify how anti-angiogenic approaches can be effectively applied to NF1 tumors. Invivo and in vitro models were used to firmly conclude that Nf1 haploinsufficiency in endothelial cells results inexaggerated proliferation and angiogenesis in response to key pro-angiogenic factors. Results implicate these growthfactor pathways as potential targets for therapeutic agents. In addition, endostatin was found to be a potent inhibitorof Nf1+/- endothelial cell migration in vitro, suggesting endostatin may be an effective antiangiogenic agent forreducing NF1 tumor growth. Two intraneural xenograft models of NF1 peripheral nerve sheath tumors weredeveloped and characterized. Tumor growth and vascularity of NF1 tumor xenografts was quantified by advancedMRI, gadolinium permeability and dynamic contrast enhancement that match results obtained by conventionalhistological measurements. Several methods to deliver endostatin in vivo were tested and several difficulties wereencountered. Finally, cell factories made by alginate-encapsulation of 293 cells transfected with AAV-endostatinwere developed and are being refined to deliver consistent, high-dose systemic levels of endostatin. The effects ofsystemic endostatin on NF1 xenograft tumor growth will be completed in a no-cost extension of this project.
DTIC
Angiogenesis; Cardiovascular System; Therapy; Tumors

20080014426 Burnham Inst., La Jolla, CA USA
The Role of Siah1-Induced Degradation of beta-Catenin in Androgen Receptor Signaling
Matsuzawa, Shu-ichi; Nov 2007; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0007
Report No.(s): AD-A475797; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475797

The androgen receptor (AR) signaling-pathway plays crucial roles in the growth and progression of prostate cancer cells.

Recent studies indicate that beta-Catenin physically binds to AR and enhances its transcriptional activity in a ligand dependent manner. p53 has also been implicated in AR signaling because of its ability to induce expression of Siah1, which binds and activates E3 ligase complexes which degrade beta-Catenin. In this study, we demonstrated the biological significance and molecular mechanisms by which AR is regulated by the p53-induced Siah1 protein. Moreover, we identified the relevant proteins that are targeted for degradation by Siah1 besides beta-Catenin. Thus, enhanced Siah function may suppress the ability of androgen to promote tumor cell growth. Understanding more about the functions of Siah-family proteins may therefore suggest novel strategies for chemoprevention and for improved treatment of prostate cancer.
DTIC
Degradation; Hormones; Males; Proteins

20080014427 North Carolina Univ., Chapel Hill, NC USA
MicroRNA Inhibitors as Anticancer Therapies
Hammond, Scott M; Aug 17, 2007; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0607
Report No.(s): AD-A475798; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475798

MicroRNAs are small, noncoding RNAs that post-transcriptionally regulate gene expression. A polycistronic cluster of microRNAs, miR-17-92, is mis-expressed in a wide range of tumors and tumor cell lines. Ectopic expression of this microRNA cluster in cooperation with c-myc promotes development of B cell lymphoma in a mouse model. We hypothesize that inhibition of the microRNAs within this cluster is a therapeutic approach for the treatment of breast cancer. We undertook several strategies to test this using in vitro models. 1. Antisense inhibitors of microRNAs within the cluster exhibit cytotoxicity of carcinoma cells. This is dependent on nucleic acid modification chemistry. Locked nucleic acid modified antisense molecules exhibited the greatest potency, but lead to non-specific toxicity. 2. We mapped the transcriptional start region and the transcriptional regulation of this microRNA cluster. This cluster is regulated by E2F family transcription factors. Interference with transcription is a possible therapeutic strategy. Targeting of the primary transcript is second novel therapeutic approach. We are currently testing these approaches.
DTIC
Inhibitors; Ribonucleic Acids; Therapy

20080014428 Children's Hospital of Pittsburgh, Pittsburgh, PA USA
Evaluation of Molecular Inhibitors of the c-Myc Oncoprotein
Prochownik, Edward; Feb 2007; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0226
Report No.(s): AD-A475799; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475799

c-Myc is a bHLH-ZIP transcription factor that regulates the expression of a large number of target genes, which collectively promote transformation. The active form of c-Myc exists as a heterodimer with another bHLH-ZIP protein, Max. This interaction, along with c-Myc-Max sequence-specific DNA binding ability is necessary for all of c-Myc's biological properties, including transformation. The factors which make c-Myc a compelling therapeutic target have recently been reviewed. Also addressed were the various levels at which pharmacologic attacks upon c-Myc, other members of the c-Myc network, or c-Myc target genes might be aimed. Among the strategies thus far employed (with limited success) are the targeting of the CMYC gene with triplex-forming oligonucleotides, the use of anti-sense oligonucleotides to target c-Myc mRNA, the use of short, double-stranded E-box containing oligonucleotides that serve as decoy binding sites, and the use of dominant-negative forms of c-Myc. The strengths and limitations of these approaches were discussed at length in this review.
DTIC
Evaluation; Inhibitors; Molecular Weight; Proteins; System Effectiveness

20080014457 Naval Postgraduate School, Monterey, CA USA
An Analysis of Alternatives for Reducing Outpatient Military Health Care Costs for Active Duty Members and their Families: Implementing a Recommended Savings Strategy Using Defense Acquisition Principles
Jaime, Richardo; Rupert, Joshua W; Dec 2007; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475857; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475857

Rising health care costs are placing a considerable burden on Government and Department of Defense resources. At the

current rate, health care costs will likely impact the overall readiness and future force structure of the Department of Defense. In efforts to reduce or contain the costs of the military health care system, this project will propose two cost savings alternatives for providing outpatient care to active duty personnel and their dependents. In addition to analyzing the current system as an alternative (status quo), the two proposed cost-sharing alternatives are a standard co-payment and a monthly allotment program. These strategies are primarily designed to reduce Department of Defense costs by influencing the attitudes of beneficiaries toward outpatient health care, restricting their access to options with higher costs, and shifting a portion of outpatient care costs through co-payments. This project provides an in-depth analysis for each alternative using a set of assumptions for treatment possibilities based on three likely scenarios, and provides quantitative and qualitative data to arrive at a recommendation. Using acquisition principles, this project provides an implementation process for the proposed alternative that should minimize disruption in the current military health care system. This project highlights the hypothesis by implementing a cost-saving strategy to active duty and dependent outpatient care; thus, the military health care system will experience a significant cost reduction over the long run.
DTIC
Alternatives; Cost Reduction; Costs; Health; Medical Services; Military Operations

20080014494 Naval Postgraduate School, Monterey, CA USA
Cold-Chain Logistics: A Study of the Department of the Defense OCONUS Pre-Pandemic Influenza Vaccine Distribution Network
Jones, Daniel; Tecmire, Christopher; Dec 2007; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475951; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475951

The purpose of this MBA project is to suggest a standardized distribution process for the DoD of the Pandemic Influenza vaccine, filling an existing void in the National Strategy for Pandemic Influenza. Also, this project is intended to foster the communication and planning process for vaccine distribution between all stakeholders, including the DLA, COCOMs, and regional commanders. Currently, no DoD pre-pandemic vaccine distribution plan exists. This project identifies the essential infrastructure assets needed to develop a cold-chain distribution network for vaccine in a military application. Furthermore, the key communication and transportation elements needed for successful execution of this network are identified, including a discussion on information and vaccine flow through the distribution network. These ideas are organized into a model to provide an easily usable decision-making tool for cold-chain network design. Finally, an example using the model is provided, with PACOM as the example area of operation.
DTIC
Defense Program; Influenza; Logistics; Vaccines; Viruses

20080014520 State Univ. of New York, Syracuse, NY USA
Modulation of T Cell Tolerance in a Murine Model for Immunotherapy of Prostatic Adenocarcinoma. Addendum
Hurwitz, Arthur A; Sep 2007; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0085
Report No.(s): AD-A476016; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476016

The goal of this project is to characterize T cell tolerance to prostate tumor antigens and to identify the role of costimulatory receptors in overcoming this tolerance. Identification of these processes will assist in the development of novel therapeutic approaches for treating prostate cancer. We use the TRAMP model a transgenic mouse line that develops primary prostatic tumors due to expression of the SV40 T antigen (TAg) under the transcriptional control of a prostate-specific promoter. In this final addendum summary we report that subsequent to adoptive transfer of naive TAg-specific T cells into TRAMP mice there is rapid expansion and contraction of the tumor-specific T cells followed by accumulation of a population of T cells that persist in the prostate as tolerant and suppressive. Co-transfer of TAg-specific CD4+ T cells delays the tolerant suppressive phenotype of prostate-tumor-specific T cells. Transfer of CD4+ T cells does not reverse tolerance of previously-tolerized CD8+ cells. The suppressive nature of these CD8+ T cells was also studied and we demonstrate that suppression is at least in-part mediated by secreted factors. Further we demonstrate that trafficking od T cells to the TRAMP prostate may be mediated by chemokines. These data demonstrate the critical balance between T cell activation and tolerance and support a mechanism by which tumor growth may induce tolerance and suppressor activity in T cells previously primed to tumor-specific antigens. A greater understanding of how tolerance of these tumor specific T cells can be reversed will certainly lead to more potent anti-tumor immunotherapies.
DTIC
Antigens; Cancer; Modulation; Neoplasms; Prostate Gland; Rodents

20080014525 Stanford Univ., Stanford, CA USA

Alpha-v Integrin Targeted PET Imaging of Breast Cancer Angiogenesis and Low-Dose Metronomic Anti-Angiogenic Chemotherapy Efficacy

Chen, Xiaoyuan; Aug 2007; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-01-0697

Report No.(s): AD-A476032; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476032

The overall objective of this project is to develop 18F-labeled RGD peptide derivatives for breast cancer imaging with prolonged tumor retention and improved in vivo kinetics to visualize and quantify alpha v-integrin expression and subsequently evaluate the metronomic anti-angiogenic chemotherapy efficacy on tumor regression necrosis and angiogenesis. Specific Aims: (1) To optimize 18F-labeled RGD peptide tracer for breast cancer imaging with prolonged tumor retention and improved in vivo kinetics. (2) To demonstrate the feasibility of PET/18F-RGD to image breast tumor growth spread and angiogenesis as well as quantifying alpha v-integrin expression level during breast tumor neovascularization over time. (3) To evaluate the efficacy of EMD 121974/paclitaxel combination on tumor regression necrosis and angiogenesis and demonstrate the feasibility of PET/18F-RGD to monitor the treatment outcomes. Major findings: We have developed a series of novel multimeric RGD peptides for PET imaging. We have also successfully demonstrated that suitably labeled RGD peptide allows quantification of integrin expression in vivo in a non-invasive manner. We have also synthesized a RGD-paclitaxel conjugate for breast cancer integrin targeted therapy.

DTIC

Angiogenesis; Breast; Cancer; Chemotherapy; Dosage; Imaging Techniques; Mammary Glands; Necrosis; Radiochemistry

20080014537 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA

Spiritual-Based Intervention for African American Women with Breast Cancer

Brown, Diane R; Jul 2007; 149 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0494

Report No.(s): AD-A476051; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476051

Because social support has been shown to have value in decreasing morbidity and possibility in increasing length of survival in cancer patients the objectives of the study are: I) to utilize a network of oncology services churches and community organizations to recruit African American women diagnosed with breast cancer for project participation; 2) to implement the spiritual-based intervention; 3) to assess the efficacy of the intervention to positively impact treatment-related outcomes; and 4) to refine the intervention for broader dissemination. The intervention involved an experimentalicontrol group design approach. The experimental support group (intervention group) received the Spiritual-based support intervention. There were two control groups: control group A included participants in a traditional support group model and control group B included individuals who received the standard care consisting of no additional structured support. Data were gathered through a pre-test at baseline (TI) a post test at the conclusion of the 7 month intervention (T2) and at a three-month follow-up at the end of the support group sessions (T3). Findings suggest a positive influence of the spiritual support group on mental well-being with the impact diminishing over time.

DTIC

Africa; Breast; Cancer; Females; Mammary Glands; Therapy

20080014539 State Univ. of New York, Stony Brook, NY USA

Integrated Cancer Research in Five Thematic Areas of Interest

Bahou, Wadie F; Jul 2007; 16 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0754

Report No.(s): AD-A476053; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476053

During the lifespan of this award, the Cancer Institute of Long Island benefited from CPMRP funding in a manner consistent with the proposed activities of the award In the area of core instrumentation acquisition, many new imaging modalities were acquired, installed, commissioned and made available to cancer researchers as described within this report Such technology is vital to imagine both in vitro and in vivo models of cancer State-of-the-art systems in proteomics were brought on-line and rendered operational in support of cancer research These included, but were not limited to multiple TOF platforms% There was a profound restructuring of Cancer Genomic Core services that has very neatly organized the portfolio of an otherwise complex, yet vital set of analysis tools to better understand cancer genetics CDMRP funding also enabled

many young investigators to initiate new research projects to better advance the body of understanding of how cancer invades, establishes and attacks a host CDMRP support for these projects came in the form of specially described support units over multiple years% These research support units (RSU's) were a mechanism to ensure necessary support for junior faculty and work as enhancements to enable the successful establishment of their laboratories RSU support provided funds for laboratory technical personnel, small and/or specialized research equipment, and supplies Over the lifespan of this award three individuals were recruited and benefited via this initiative The faculty designees for this activity are Howard Adler, MD, Assistant Professor of Urology, Howard Crawford, PhD, Assistant Professor of Pharmacological Sciences, and Marjana Maletic-Savatic, MD-PhD, Assistant Professor of Neurology Descriptions of their projects are included within this report.
DTIC
Cancer; In Vivo Methods and Tests; Medical Science; Research Management; Systems Integration

20080014545 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Molecular Mechanisms of Bcl10-Mediated NF-kB Signal Transduction
Langel, Felicia D; Mar 8, 2006; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476063; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476063

Bcl10 is a key signaling intermediate in the TCR-to-NF-kB pathway in T lymphocytes. It is currently believed that, once activated, Bcl10 functions within a multiprotein signaling complex that activates the IKK complex. Bcl10 is thought to regulate this signaling complex, but how it transmits its signal through the complex is unknown. A thorough knowledge of Bcl10 biology is critical to understanding how Bcl10 functions and how it regulates its binding partners. In this study, we used mutational analysis molecular imaging, biochemistry, and computer/bioinformatics modeling to elucidate a structure and function for Bcl10. From our data, we identified a novel binding site for MALT1 within the Bcl10 protein, hypothesized that this site is completely separate and distinct from the binding sites of other Bcl10 signaling partners, and proposed two regulatory functions for the Bcl10 C-terminus. These findings suggest that Bcl10 has multiple functional domains and, hence, that Bcl10 molecular biology is more complex than previously thought. These observations serve to emphasize Bcl10's role as a crucial regulator of the TCR-to-NF-kB signaling pathway.
DTIC
Genetics; Immunity; Lymphocytes; Physiological Responses; Transferring

20080014548 University of Central Florida, Orlando, FL USA
Determining Extracellular Matrix Deposition Quantity and Composition from Cells in Response to Electronic Materials
Hickman, James J; Bielitzki, Joseph; Hirsh-Kuchma, Melissa; Anderson, Jeff; Saunders, Kate; Wolf, Cathleen; Nov 8, 2007; 32 pp.; In English
Contract(s)/Grant(s): FA9550-05-1-0487
Report No.(s): AD-A476083; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476083

The project objectives were to determine the composition and quantity of the extracellular matrix (ECM) that is deposited by the cells when placed in contact, either in vivo or in vitro, with electronic materials. In addition, a defined serum-free in vitro system developed in this laboratory was used to identify% favorable and unfavorable materials, both biological and non-biological, that could be used to enhance interactions of cells and tissue with electronic components. Pure cultures of embryonic hippocampal neurons do not produce large areas of ECM spread over the coverslip. The cells deposit ECM proteins as a barrier to the inorganic DETA surface, possibly as a way to control their microenvironment, especially since the protein composition did not differ as a function of surface hydrophilicity or hydrophobicity. The neurons secrete laminin and collagen, but it is mostly concentrated around the soma and under the processes. In pure in vitro culture, the neurons do not secrete fibronectin, which seems to be the role of glial cells.
DTIC
Deposition; Photoelectron Spectroscopy; X Ray Spectroscopy

20080014551 Rosalind Franklin Univ. of Medicine and Science, Chicago, IL USA
The Identification of Splice Variants as Molecular Markers in Parkinson's Disease
Meredith, Gloria E; Sep 2007; 77 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0580
Report No.(s): AD-A476088; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476088

Alternative splicing is responsible for producing several products from a single transcript and can cause pathogenic changes in RNA in neurodegenerative disease. This proposal tests the hypothesis that regulation of normal splicing is disrupted in Parkinson's disease (PD). Scope: Experiments are designed to determine splicing products in the brain and blood of experimental MPTP models of PD and the blood of newly diagnosed PD patients, who are not yet on dopamine therapy. The overall goal is to use splice variants as biomarkers to identify individuals at risk for PD. To date, we have identified and quantified alternatively spliced transcripts for several candidate genes in MPTP models of PD. We have also obtained IRB permission to study splicing factors in the blood of newly diagnosed PD patients. Major Findings: Mice treated acutely and chronically with MPTP show a shift in the ratio of FosB, RGS9, AChe and Ania6 splice variants in the striatum and blood. Gene expression (in situ hybridization) studies are in progress to localize the variants in the brain. Progress in the second year includes 3 abstracts, one published article, a second article submitted and an article in preparation.
DTIC
Diseases; Markers

20080014552 Columbia Univ., New York, NY USA
Endoplasmic Reticulum Stress as a Mediator of Neurotoxin-Induced Dopamine Neuron Death
Burke, Robert E; Jul 2007; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0492
Report No.(s): AD-A476089; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476089

Programmed cell death (PCD) is an important mediator of neural degeneration in Parkinson's disease (PD). The goal of this proposal was to examine in vivo the possible role of ER stress, a mediator of PCD, in dopamine neuron death. This was done by studying mice with targeted deletions of CHOP, an upstream transcriptional mediator, and caspase-12, a downstream mediator, of ER stress-induced apoptosis. We have found that CHOP is universally expressed in neurotoxin models of PD, and that it is an essential mediator of apoptosis in the 6OHDA neurotoxin model. The CHOP null mutation does not, however, protect dopamine neurons in the chronic MPTP model, indicating that these two models are mediated by distinct mechanisms. Although CHOP is best known as a death mediator due to ER stress, we were unable to confirm the presence of ER stress in the 6OHDA model by analysis of BiP and the XBP-1 splice variant. Furthermore, we have shown that caspase-12 null mice are not protected from 6OHDA. Since caspase-12 is a critical mediator of PCD due to ER stress, these results suggest that the upregulation of CHOP in the 6OHDA model is not mediated by ER stress, but rather oxidative insult. In the final year of this award, we have found that homozygous JNK2/3 double null mutations diminish the induction of CHOP, indicating that the MAPK pathway regulates its expression. We have found also that JNK2 and JNK3 are essential mediators of neuron death in this neurotoxin model.
DTIC
Apoptosis; Death; Diseases; Dopamine; Endoplasmic Reticulum; Neurons

20080014557 Library of Congress, Washington, DC USA
Avian Flu Pandemic: Potential Impact of Trade Disruptions
Langton, Danielle; Jan 3, 2008; 7 pp.; In English
Report No.(s): AD-A476111; CRS-RS22453; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476111

Concerns about potential disruptions in U.S. trade flows due to a global health or security crisis are not new. The possibility of an avian flu pandemic with consequences for global trade is a concern that has received attention recently, although some experts believe there is little cause for alarm. Experts disagree on the likelihood of an avian flu pandemic developing at all. This report considers possible trade disruptions, including possible impacts on trade between the USA and countries and regions that have reported avian influenza infections. These trade disruptions could include countries banning imported goods from infected regions at the onset of a pandemic, de facto bans due to protective health measures, or supply-side constraints caused by health crises in exporting countries.
DTIC
Birds; Disrupting; Influenza; International Trade

20080014647 New York Univ., New York, NY USA

DNA Hypermethylation Patterns Detected in Serum as a Tool for Early Breast Cancer Diagnosis

Brooks, Jennifer; Sep 2007; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0723

Report No.(s): AD-A476090; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The promoter regions of some genes, in particular tumor suppressor genes, are frequently hypermethylated in cancer, but not normal cells. We are conducting a nested case-control study (within the NYUWHS cohort) to assess the potential of serum DNA hypermethylation markers as a tool for early detection of breast cancer. Case-control selection criteria have been designed, the first 200 subject (of 452 subjects in total) selected and cases and their 3 controls matched for age and date of blood donation. DNA has been extracted for these first 200 subjects (50 case-control sets) and stored in aliquots at -20 C until further analysis. DNA methylation analysis requires two basic steps. DNA is chemically modified using sodium bisulfite, creating methylation specific sequence variation that is detectable using quantitative methylation-specific real-time PCR (QMSP). QMSP reactions have been optimized and sensitivity to one genome copy has been attained. Work on the methodological issues surrounding the sodium bisulfite protocol continues. Early detection is an important determinant of breast cancer prognosis and survival. This study is the first to examine aberrant promoter methylation patterns in pre-diagnostic serum samples, taking a step closer to the development of a panel of markers to be incorporated into screening strategies.

DTIC

Breast; Cancer; Deoxyribonucleic Acid; Diagnosis; Mammary Glands; Serums

20080014669 California Univ., San Francisco, CA USA

Killing Prostate Cancer Cells and Endothelial Cells with a VEGF-Triggered Cell Death Receptor

Quinn, Timothy P; Jun 2005; 135 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0029

Report No.(s): AD-A476159; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project was to test a novel chimeric cell death receptor (termed R2Fas) that is triggered by vascular endothelial growth factor (VEGF), as a means to kill prostate cancer cells and vascular endothelial cells. The scope of this project involved: (i) creating adenoviral reagents to express the R2Fas receptor in prostate cancer cells and endothelial cells; (ii) determining if the R2Fas receptor kills cells in a VEGF-dependent manner; and (iii) identifying methods for increasing the killing activity of R2Fas. The major findings were: (i) we generated replication-defective adenoviral reagents to express R2Fas as well as control adenoviruses; (ii) we demonstrated that adenoviral-mediated expression of R2Fas in prostate cancer cells that overexpress VEGF activates apoptotic signaling and induces cell death; (iii) we demonstrated that adenoviral-mediated expression of R2Fas in human endothelial cell is non-toxic, but rendered the cells sensitive to killing when treated with VEGF; and (iv) we demonstrated that R2Fas-mediated apoptosis can be potentiated by addition of several pharmacologic agents, including camptothecin, etoposide, taxol, doxorubicin, cisplatin, and BisVIII.

DTIC

Apoptosis; Cancer; Death; Endothelium; Prostate Gland

20080014674 California Univ., Davis, CA USA

Theoretical Modeling of Molecular Mechanisms, Strains, and Time Scales in Prion Diseases

Cox, Daniel L; Singh, Rajiv R; Jul 2005; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0480

Report No.(s): AD-A476184; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have obtained significant results modeling: (1) the structure of the minimal infectious prion oligomer as a domain swapped beta helical trimer; (2) metal binding to the prion protein showing results consistent with measured affinities and suggesting a detailed molecular role for the protection of the normal prion form against conversion to the infectious scrapies form when copper is bound to a particular site; (3) kinetics of yeast prion aggregation in vitro illustrating the role of fission; (4) kinetic analysis of transgenic mice time course data for anchorless cellular prions, indicating (a) that the membrane is necessary for exponential growth of infectious aggregate, and (b) that the elongation rate of anchorless prions is likely more rapid than anchored ones. In the coming year we will explore the role of our domain swapped model for 1) understanding strains, 2) understanding a subset of point mutations known to induce disease for those who inherit them,3) possible docking of octarepeats to the beta helical trimers and their role in prion conversion, 4) additional metal binding to the prion protein

(iron, sodium, and copper at H111), and (5) the role of the membrane in inducing exponential growth of infectivity.
DTIC
Diseases; Mathematical Models; Molecular Properties; Oligomers

20080014675 Library of Congress, Washington, DC USA
Afghanistan: Narcotics and U.S. Policy
Blanchard, Christopher M; Dec 7, 2004; 40 pp.; In English
Report No.(s): AD-A476185; CRS-RL32686; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Opium poppy cultivation and drug trafficking have become significant factors in Afghanistan's fragile political and economic order over the last 25 years. Since the fall of the Taliban in late 2001, Afghanistan has become the source of 87% of the world s illicit opium and heroin, in spite of ongoing efforts by the Afghan government, the USA, and their international partners to combat poppy cultivation and drug trafficking. Across Afghanistan, regional warlords, criminal organizations, and corrupt government officials continue to exploit opium production and trafficking as reliable sources of revenue and patronage, which perpetuates the threat these groups pose to the country s fragile internal security and the legitimacy of its embryonic democratic government. The trafficking of Afghan drugs also appears to provide financial and logistical support to a range of extremist groups operating in and around Afghanistan, including remnants of the Taliban regime and Al Qaeda operatives. U.N. officials estimate that in-country illicit profits from Afghanistan s record 2004 opium poppy crop were equivalent in value to 60% of the country s legitimate GDP. Some analysts suggest that drug-tainted warlords, tribal leaders, and local officials may jeopardize Afghanistan s security. The issue is further complicated by an aspect of coalition forces pursuit of security and counterterrorism objectives: frequent reliance on warlords, tribal leaders, and local officials who may be involved in the production and trafficking of narcotics. The failure of U.S. and international counternarcotics efforts to significantly disrupt the Afghan opium trade or sever its links to warlordism and corruption since the fall of the Taliban has led some observers to warn that without redoubled multilateral action, Afghanistan may succumb to a state of lawlessness and reemerge as a sanctuary for terrorists.
DTIC
Afghanistan; Alkaloids; Drugs; Narcotics; Policies

20080014677 Evanston Northwestern Healthcare Research Inst., Evanston, IL USA
Role of p53 in Mammary Epithelial Cell Senescence
Dimri, Goberdhan P; May 2007; 62 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0509
Report No.(s): AD-A476193; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The tumor suppressor p53 plays an important role in a variety of cancers including breast cancer. It inhibits the growth of malignant cells either by inducing G1 arrest, apoptosis or senescence. We are determining the role of p53 in human mammary epithelial cell (HMEC) senescence and the requirement of p53 inactivation in transformation of HMECs. In this report, we have found that p53 downregulation is required to overcome H-Ras induced senescence during transformation of HMECs. Downregulation of p53 resulted due to cooverexpression of Bmi-1 with H-Ras in transforming MCF10A strain of HMECs. We also continued to perform chromatin immunoprecipitaion linked PCR (ChIP) assay to identify targets of p53 involved in replicative senescence of HMECs. ChIP assays were performed using senescent 76N cells. The DNA obtained after chromatin IP of senescent cells using p53 antibody was amplified using linkers and cloned in a pGEM plasmid vector. Several clones were selected and sequenced to identify p53 regulated genes. Many clones contained p53 binding sites suggesting that genes represented in these particular clones are regulated by p53 during HMEC senescence. These genes are likely to have a role in p53-medaited tumor-suppression.
DTIC
Aging (Biology); Breast; Cancer; Mammary Glands

20080014691 General Accounting Office, Washington, DC USA
VA and DOD Health Care: Administration of DOD's Post-Deployment Health Reassessment to National Guard and Reserve Servicemembers and VA's Interaction with DOD
Kanof, Marjorie; Jan 25, 2008; 19 pp.; In English
Report No.(s): AD-A476274; GAO-08-181R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

For servicemembers who have been deployed overseas whether National Guard, Reserve, or active duty the Department of Defense (DOD) has developed a continuum of programs to assess servicemembers' health needs by obtaining information

on their health concerns. One health assessment is administered before deployment, another about the time servicemembers return from deployment, and a third 90 to 180 days after deployment, which is called the post-deployment health reassessment (PDHRA). Congressional interest in health care services for National Guard and Reserve servicemembers returning from deployment has increased because of their large numbers and because they have reported post-deployment mental health concerns at a higher rate than their active duty counterparts, though this varies by military service. Related to this interest, you asked us to describe the administration of the PDHRA to National Guard and Reserve servicemembers. This report describes (1) how DOD administers the PDHRA to National Guard and Reserve servicemembers and what information it obtains and (2) how VA interacts with DOD in the PDHRA process for these servicemembers and the information VA obtains.
DTIC
Armed Forces (United States); Atmospheric Sounding; Deployment; Health; Medical Services; Reserves; Satellite Sounding

20080014700 Arizona Univ., Tucson, AZ USA
Identification Of Protein Vaccine Candidates Using Comprehensive Proteomic Analysis Strategies
Rohrbough, James G; Dec 2007; 189 pp.; In English
Report No.(s): AD-A476313; CIO8-0003; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Presented in this dissertation are proteomic analysis studies focused on identifying proteins to be used as vaccine candidates against Coccidioidomycosis, a potentially fatal human pulmonary disease caused by inhalation of a spore from the soil-dwelling pathogenic fungi Coccidioides posadasii and C. immitis. A method of tandem mass spectrometry data analysis using dual protein sequence search algorithms for increasing the total protein identifications from an analysis is described. This method was utilized in a comprehensive proteomic analysis of cell walls isolated from the dimorphic fungal pathogen C. posadasii. A strategy of tandem mass spectrometry-based protein identification coupled with bioinformatic sequence analysis was used to produce a list of protein vaccine candidates for further testing. A differential proteome analysis using stable isotope protein labeling was undertaken to identify vaccine candidate proteins that are more highly expressed in the spherule, or pathogenic phase, of C. posadasii. The results of these analyses are 9 previously undescribed protein vaccine candidates isolated from spherule cell walls that have sequence indications of extracellular association such as GPI anchors and N-terminal signal sequences and antigen potential based on homology to known antigenic or secreted proteins. An additional 14 proteins identified from spherule cell walls are potential vaccine candidates based on extracellular sequence predictions without any indications of antigenic potential. The stable isotope labeling study has identified 3 more proteins that are preferentially expressed in spherules and exhibit antigenic potential based on extracellular localization or homology to known antigenic proteins. Additionally, there were 5 unknown function proteins identified by stable isotope labeling that are more highly expressed in spherules that may be good vaccine candidates but cannot be identified or localized by sequence analysis.
DTIC
Fungal Diseases; Fungi; Pathogenesis; Proteins; Proteome; Vaccines

20080014701 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Oligonucleotide Fingerprint Identification for Microarray-Based Pathogen Diagnostic Assays
Waibhav, Tembe; Zavaljevski, Nela; Bode, Elizabeth; Chase, Catherine; Geyer, Jeanne; Wasieloski, Leonard; Benson, Gary; Reifman, Jaques; Oct 2006; 10 pp.; In English
Report No.(s): AD-A476314; PR-06-093; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Advances in DNA microarray technology and computational methods have unlocked new opportunities to identify 'DNA fingerprints,' i.e., oligonucleotide sequences that uniquely identify a specific genome. We present an integrated approach for the computational identification of DNA fingerprints for design of microarray-based pathogen diagnostic assays. We provide a quantifiable definition of a DNA fingerprint stated both from a computational as well as an experimental point of view, and the analytical proof that all in silico fingerprints satisfying the stated definition are found using our approach. The presented computational approach is implemented in an integrated high-performance computing software tool for oligonucleotide fingerprint identification termed TOFI. We employed TOFI to identify in silico DNA fingerprints for several bacteria and plasmid sequences, which were then experimentally evaluated as potential probes for microarray-based diagnostic assays. Results and analysis of approximately 150 in silico DNA fingerprints for Yersinia pestis and 250 fingerprints for Francisella tularensis are presented.
DTIC
Assaying; Deoxyribonucleic Acid; Oligonucleotides; Pathogens

20080014702 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Deployable, Field-Sustainable, Reverse Transcription-Polymerase Chain Reaction Assays for Rapid Screening and Serotype Identification of Dengue Virus in Mosquitoes

McAvin, James C; Powers, Michael D; Blow, Jamie A; Putnam, John L; Huff, William B; Swaby, James A; Mar 2007; 8 pp.; In English

Report No.(s): AD-A476317; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Dengue virus universal and serotype 1 to 4 fluorogenic probe hydrolysis, reverse transcription (RT)-polymerase chain reaction (PCR) assays and positive-control RNA template were freeze-dried in a thermally stable, hydrolytic enzyme-resistant format and deployed for testing in a dengue fever-endemic region of Thailand. The study site presented austere testing conditions. Field-collected Aedes aegypti mosquitoes and individual and pooled, field-collected, A. aegypti, A. albopictus, and Culex tritaeniorhynchus mosquitoes were used for RT-PCR assay evaluations. For dengue virus-inoculated A. aegypti mosquitoes and spiked samples, in vitro sensitivity and specificity results for all five assays were concordant with indirect fluorescent antibody assay results. A single pool of field-collected, female A. aegypti mosquitoes was identified as dengue virus positive. Cross-reactivity was not observed across heterologous serotypes, mosquito vectors, or human DNA. The limit of detection was > 7 to ≥ 70 genomic equivalents. Sample processing and and analysis required > 2 hours. These results show promise of field-formatted RT-PCR reagents for rapid, sensitive, specific dengue virus screening and serotype identification in mosquitoes under field-deployable conditions.

DTIC

Assaying; Diseases; Infectious Diseases; Viruses

20080014703 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Coxiella Burnetii: Host and Bacterial Responses to Infection

Waag, David M; Oct 16, 2007; 9 pp.; In English

Report No.(s): AD-A476318; TR-07-038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Designation as a Category B biothreat agent has propelled Coxiella burnetii from a relatively obscure, underappreciated, 'niche' microorganism on the periphery of bacteriology, to one of possibly great consequence if actually used in acts of bioterrorism. Advances in the study of this microorganism proceeded slowly, primarily because of the difficulty in studying this obligate intracellular pathogen that must be manipulated under biosafety level-3 conditions. The dogged determination of past and current C. burnetii researchers and the application of modern immunological and molecular techniques have more clearly defined the host and bacterial response to infection. This review is intended to provide a basic introduction to C. burnetii and Q fever, while emphasizing immunomodulatory properties, both positive and negative, of Q fever vaccines and C. burnetii infections.

DTIC

Bacteria; Infectious Diseases; Microorganisms

20080014704 Arizona State Univ., Tempe, AZ USA

Competitive Nurse Rostering and Rerostering

Chiaramonte, Michael V; May 2008; 154 pp.; In English

Report No.(s): AD-A476319; CIO8-0005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nurse rostering is the assignment of specific nurses to specific shifts for a future scheduling period. The work schedule that is created is called a roster. The reconstruction of a disrupted roster is called rerostering. When solving the rostering and rerostering problems there are two considerations: the organization's costs and the nurses preferences. Traditional solution methods, often based on integer programs (IP), have two short comings; first, they rely on one objective function to represent both the organization's and nurses goals; second, rostering requires either the complete resolving of the rostering problem or a new solution method to fix the roster. We propose three agent-based auction heuristics, Competitive Nurse Rostering (CNR), an extension called CNR-Iterated Local Search (CNR-ILS), and an extension of CNR-ILS called CNRRerostering (CNRR). These heuristics are the first nurse rostering methods that model each nurse's preferences in separate objective functions. The heuristics are the first competitive agent-based rostering and rerostering methods. They uniquely separate the organizational cost and nurse preference problems by constraining the preference problem s solutions space to alternate cost optimal solutions. CNRR is the first rostering solution that can reroster nurses. When tested in a real hospital, CNR and CNR-ILS solved the rostering problem 99% faster than the hospital s rostering method and an IP solution from the literature. Nurses consistently favored the solutions from CNR-ILS compared to those from CNR, the IP and the hospital. CNRR finds solutions

to the rerostering problem over 90% of the time. Less than one sixth of the solutions had a serious impact to nurse preferences.
DTIC
Medical Personnel; Scheduling

20080014710 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Development of a Model for Marburgvirus Based on Severe-Combined Immunodeficiency Mice
Warfield, Kelly L; Alves, Derron A; Bradfute, Steven B; Reed, Daniel K; Kalina, Warren V; Olinger, Gene G; Bavari, Sina; VanTongeren, Sean; Oct 25, 2007; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476329; USAMRIID-TR-07-062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The filoviruses, Ebola (EBOV) and Marburg (MARV), cause a lethal hemorrhagic fever. Human isolates of MARV are not lethal to immmunocompetent adult mice and, to date, there are no reports of a mouse-adapted MARV model. Previously, a uniformly lethal EBOV-Zaire mouse-adapted virus was developed by performing 9 sequential passages in progressively older mice (suckling to adult). Evaluation of this model identified many similarities between infection in mice and nonhuman primates, including viral tropism for antigen-presenting cells, high viral titers in the spleen and liver, and an equivalent mean time to death. Existence of the EBOV mouse model has increased our understanding of host responses to filovirus infections and likely has accelerated the development of countermeasures, as it is one of the only hemorrhagic fever viruses that has multiple candidate vaccines and therapeutics. Here, we demonstrate that serially passaging liver homogenates from MARV-infected severe combined immunodeficient (scid) mice was highly successful in reducing the time to death in scid mice from 50-70 days to 7-10 days after MARV-Ci67, -Musoke, or -Ravn challenge. We performed serial sampling studies to characterize the pathology of these scid mouse-adapted MARV strains. These scid mouse-adapted MARV models appear to have many similar properties as the MARV models previously developed in guinea pigs and nonhuman primates. Also, as shown here, the scid-adapted MARV mouse models can be used to evaluate the efficacy of candidate antiviral therapeutic molecules, such as phosphorodiamidate morpholino oligomers or antibodies.
DTIC
Fever; Hemorrhages; Infectious Diseases; Mice; Models

20080014722 Naval Medical Research Inst., Great Lakes, IL USA
Analyzing the Utilization of Interferon-Gamma Screening for Tuberculosis at Recruit Training Command, Great Lakes
Mitchell, David P; May 31, 2006; 42 pp.; In English
Report No.(s): AD-A476367; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The tuberculin skin test for diagnosis of Mycobacterium tuberculosis has many limitations when applied to serial testing of recruits in a restrictive training environment. One year ago the FDA approved QuantiFERON-TB Gold (Trademark) as a blood test to screen for tuberculosis and latent tuberculosis. This product uses a combination of CFP-10 and ESAT-6 proteins to elicit in vitro response of white blood cells to detect prior exposure to m. tuberculosis. The main benefit of the test is it only requires one visit to the physician's office, saving both time and money. Because the test is new, a comparison of the two products singularly and in a two-tiered model was completed testing each product for accuracy, functionality, risk, and cost to determine which test was better suited for use in an environment where the protection of military readiness was the goal. Applying sensitivity and specificity values from journal publications; it was found that two-tier testing was most accurate and cost-effective, while the tuberculin skin test was the most risk averse, and the QuantiFERON-TB Gold (Trademark) had the highest process functionality. When applied to a decision matrix based upon the priorities of the military, the conclusion is to continue to use the Mantoux TST due to the lower overall risk to military readiness.
DTIC
Education; Gold; Great Lakes (North America); Interferon; Navy; Tuberculosis

20080014724 Virginia Univ., Charlottesville, VA USA
Role of STAT5b in Breast Cancer Progression and Metastasis
Bernaciak, Teresa; Sep 2007; 15 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0738
Report No.(s): AD-A476372; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The signal transducer and activator of transcription (STAT) 5b is involved in tumorigenic signaling in a number of cancers including breast cancer. However, its importance in breast cancer metastasis has not been investigated. Thus, this research aims to determine the role of STAT5b in breast cancer migration, invasion, and metastasis. We have found that STAT5b is essential

for BT-549 and MDA-MB-231 migration to serum, as evidenced by the fact that knockdown of STAT5b inhibits migration in these cell lines by 60-80%. In addition, STAT5b knockdown inhibits BT-549 invasion through Matrigel. Furthermore, while these cells migrate well to vitronectin, this migration is inhibited in the absence of STAT5b. Therefore, STAT5b is important for migration and invasion of breast cancer cells and may be involved in adhesion of these cells to vitronectin. Further elucidating the mechanism by which STAT5b promotes migration and invasion of breast cancer cells may lead to more effective treatments for preventing and treating metastasis.
DTIC
Breast; Cancer; Mammary Glands; Metastasis

20080014829 Environmental Protection Agency, Cincinnati, OH, USA
Mold Species in Dust from the International Space Station Identified and Quantified by Mold Specific Quantitative PCR
Vesper, Stephen J.; Wong, Wing; Kuo, C. Mike; Pierson, Duane L.; January 2008; 10 pp.; In English; Copyright; Avail.: CASI: A02, Hardcopy

Dust was collected over a period of several weeks in 2007 from various HEPA filters in the U.S. Laboratory Module of the International Space Station (ISS). The dust was returned on the Space Shuttle Atlantis, mixed, sieved, and the DNA was extracted. Using a DNA-based method called mold specific quantitative PCR (MSQPCR), 39 molds were measured in the dust. Opportunistic pathogens Aspergillus flavus and A. niger and toxin producers Penicillium chrysogenum and P. brevicompactum were found at relatively high concentrations (compared to U.S. homes). No cells of the opportunistic pathogens A. fumigatus, A. terreus, Fusarium solani or Candida albicans were detected.
Author
Dust; Space Shuttles; Deoxyribonucleic Acid; Fungi; Pathogens; International Space Station

20080015366 NASA Johnson Space Center, Houston, TX, USA
Achieving Workplace Health through Application of Wellness Strategies
Robinson, Judith L.; April 03, 2008; 21 pp.; In English; Corporate Health Improvement Program, 3 Apr. 2008, San Diego, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015366

Purpose: 1) Understand and measure JSC workplace health: a) levels, sources, indicators & effects of negative, work-related stress; b) define leading indicators of emerging issues. 2 Provide linkage to outcomes: a) Focus application of wellness strategies & HR tools; b) Increase quality of work life and productivity. 3) Current effort will result in: a) Online assessment tool; b) Assessment of total JSC population (civil service & contractors); c) Application of mitigation tools and strategies. 4) Product of the JSC Employee Wellness Program. 5) Collaboration with Corporate Health Improvement Program/University of Arizona.
Derived from text
Organizations; Health; Personnel; Productivity; Populations

20080015389 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
Targeting Mechanisms of Resistance to Taxane-Based Chemotherapy
Huang, Chung-Ying; Sep 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0566
Report No.(s): AD-A475749; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475749

Patients with high-risk localized prostate cancer have a high recurrence rate following primary therapy. Neoadjuvant chemotherapy has been shown to be beneficial in reducing recurrence rates in some tumor types but has yet to be of proven benefit in prostate cancer. Further current clinical pathological and molecular markers poorly predict the response and resistance of chemotherapy and the molecular mechanisms of chemotherapy resistance are largely unknown. We utilized tissue resources from a unique prospective phase II clinical trial of neoadjuvant chemotherapy with docetaxel and mitoxantrone in patients with high-risk localized prostate cancer to identify molecular alterations after chemotherapy and correlated these alterations with clinical and pathological indicators of tumor response. We hypothesized that this approach may identify

molecular signatures of chemotherapy resistance and uncover mechanisms or pathways suitable for targeting with the objective of improving tumor responses to chemotherapy. Gene expression changes after chemotherapy were measured in 31 patients who completed 4 cycles of docetaxel and mitoxantrone neoadjuvant chemotherapy. The chemotherapy induced profile was further correlated with clinical outcome including percentage of PSA decline and PSA-relapse free survival. Cytokines and cytokine pathways were found to be associated with immediate clinical outcome measured by percentage of PSA decline. Four cytokines including ILS CXCL10 IL1B and CCL2 were included for further analysis. Expression changes ofthese4 cytokines by qRT-PCR were correlated with percentage of PSA decline. Expression changes of ILS and CXCL10 were significantly and negatively associated with percentage of PSA decline. Further in vitrotests showed only CXCL10 but not ILS conferring chemoresistance to prostate cancer cells. When using longer term clinical outcome we found genes correlated with PSA-relapse free survival.
DTIC
Chemotherapy; Cancer; Prostate Gland

20080015488 Air Univ., Maxwell AFB, AL USA
The 'Worried Well' Response to CBRN Events: Analysis and Solutions
Stone, Fred P; Jun 2007; 64 pp.; In English
Report No.(s): AD-A475818; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475818

Chemical, biological, radiological, or nuclear (CBRN) weapons in the hands of a terrorist or a rogue state is one of the greatest threats to the security of the USA. These weapons of mass destruction (WMD) can cause catastrophic loss of life and innumerable injuries and can challenge the U.S. health care system beyond its capacity to provide treatment. Most hospitals do not have the beds, equipment, staff, or facilities to adequately respond to a WMD event. Compounding this problem is that many people who have minimal or no exposure to a CBRN agent will seek medical care and slow down medical treatment of genuinely affected patients. These 'worried well' patients may comprise as many as 20 times the number of legitimate patients and may become one of the most difficult aspects of dealing with WMD events. This paper is an examination of the worried well phenomenon. It looks at three CBRN events that are often noted for unaffected masses seeking medical care: the Goiania Radiation Incident, the Aum Shinrikyo Attack, and the Anthrax Letters Incident. The purpose of the paper is twofold. First, it provides a better understanding of the worried well response. Existing worried well literature often contains bold proclamations of the problem without substantial analysis; researchers often cite cases but fail to provide any indepth study of them. This paper provides a closer examination of the cases and shows that the worried well response is neither irrational nor characterized by panic. Instead, when examined from informational, medical, and psychological perspectives, the worried well response is largely a rational reaction. Second, the paper provides a strategy to mitigate the worried well response in CBRN events. The paper cannot provide a detailed worried well response plan for every possible CBRN event, but it does provide the basic elements to reduce the response and still allow proper health care for everyone affected by a CBRN event.
DTIC
Anxiety; Destruction; Fear; Medical Services; Patients; Radiology; Responses

20080015527 Army Medical Research and Materiel Command, Fort Detrick, MD USA
Telemedicine in the Context of Force Protection
Lam, David M; Mar 1, 2007; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476382; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Medical Services; Military Operations; North Atlantic Treaty Organization (NATO); Protection; Telemedicine

20080015530 Tennessee Univ., Memphis, TN USA
Development of Hemostatic Agents
Moore II, Bob M; Jan 31, 2008; 24 pp.; In English
Contract(s)/Grant(s): N00014-05-C-0269
Report No.(s): AD-A476310; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To translate investigational hemostatic agents developed in the rat model to swine models of lethal groin injury and liver laceration. This objective evaluated the efficacy of patch and granule formulations of capsaicin (CP-305) in normal and

coagulopathic swine models. The thermal stability of the dmg patches was studied at elevated temperatures to assess shelf life of the hemostatic agent. The remaining objectives were to study the mechanism of action of vanilloid compounds on whole blood aggregation and develop bio-degradable vanilloid compounds.
DTIC
Blood Coagulation; Hemostatics

20080015558 National Defense Univ., Washington, DC USA
Looking for Trouble: A Policymaker's Guide to Biosensing
Armstrong, Robert; Coomber, Patricia; Prior, Stephen; Dincher, Ashley; Jun 2004; 68 pp.; In English
Report No.(s): AD-A476354; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Protecting the population against the effects of a bioterrorism attack is one of the most daunting tasks facing government officials. Some of the information required to make informed decisions is highly technical, and even the technical experts do not agree about many of the details or issues involved. This primer is written for the non-technical policymaker and is designed to assist him or her in reaching important decisions regarding how best to help provide early warning of a biological attack. The authors also present the results of an extensive statistical study that examined the utility of a system-of-systems approach to identifying a bioattack. Using a hypothetical system-of-systems that obtains medically relevant data from 10 sources, the study reaches several conclusions. Among them, that policymakers: ' Reassess efforts currently underway that attempt to capture data from absenteeism reporting, OTC pharmacy sales and medical claims reporting, because their value added may not be worth the cost. ' Increase efforts to collect medical data. These efforts would include, but not be limited to, capturing data from doctors offices and ER visits, as well as expanded veterinary and agricultural surveillance. Increase data collection from medical website visits and nurse helplines. ' Reassess current plans to significantly increase the number of biosensors deployed as part of both the BioWatch and Guardian programs. Finally, the authors propose testing an innovative approach to monitoring for the presence of biological pathogens. They recommend that the 23,500-strong workforce of law enforcement officers, firefighters and mail carriers in Washington, D.C., be monitored daily by thermal imagers for increases in body temperature. This workforce is uniformly distributed throughout the city and is both inside and outside of buildings, thus avoiding some of the problems cited with the current use of stationary sensor systems.
DTIC
Biological Effects; Detection

20080015562 National Defense Univ., Washington, DC USA
Who You Gonna Call? Responding to a Medical Emergency with the Strategic National Stockpile
Prior, Stephen D; Jun 2004; 30 pp.; In English
Report No.(s): AD-A476356; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prior to the terrorist attacks of September 11, 2001 and the subsequent anthrax attacks, the Strategic National Stockpile (SNS), known as the National Pharmaceutical Stockpile until March 2003, was an important component of the national medical response to a crisis, but one that had not yet been tested in a real emergency. That changed in the fall of 2001. Since the terrorist attacks against the World Trade Center buildings and the Pentagon, and the later anthrax episodes, the cost of the SNS has grown from a roughly $50 million asset to one worth more than $600 million. The SNS is designed to supplement state and local public health agencies in the event of a biological or chemical terrorism incident anywhere and at anytime in the USA or its territories. Federal authorities do not consider the stockpile a first-response tool. Rather, its purpose is to bolster the response of a state or city government to a biological or chemical attack or other medical emergency that requires additional resources. The SNS is managed jointly by the Departments of Homeland Security (DHS) and Health and Human Services (HHS). Its use is coordinated through the Centers for Disease Control and Prevention (CDC), one of the major operating components of HHS. The stockpile comprises 12 separate 'push packages,' each capable of reaching its designated destination within 12 hours of DHS authorization. Each push package includes caches of pharmaceuticals, antidotes, and medical supplies designed to provide a broad spectrum of assets in the early hours of an event. The push packages are positioned in strategically located, secure warehouses and delivered by commercial, express carriers. Additional, specially tailored supplies known as vendor managed inventory (VMI) can follow within 24 to 36 hours of an event.
DTIC
Emergencies; Medical Services; Security; Stockpiling

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*.

20080014275 NASA Johnson Space Center, Houston, TX, USA

Lunar Balance and Locomotion

Paloski, William H.; [2008]; 1 pp.; In English; 79th Annual Scientific Meeting of the Aerospace of the Medical Association, 11-15 May 2008, Boston, MA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Balance control and locomotor patterns were altered in Apollo crewmembers on the lunar surface, owing, presumably, to a combination of sensory-motor adaptation during transit and lunar surface operations, decreased environmental affordances associated with the reduced gravity, and restricted joint mobility as well as altered center-of-gravity caused by the EVA pressure suits. Dr. Paloski will discuss these factors, as well as the potential human and mission impacts of falls and malcoordination during planned lunar sortie and outpost missions. Learning objectives: What are the potential impacts of postural instabilities on the lunar surface? CME question: What factors affect balance control and gait stability on the moon? Answer: Sensory-motor adaptation to the lunar environment, reduced mechanical and visual affordances, and altered biomechanics caused by the EVA suit.

Author

Biodynamics; Locomotion; Lunar Surface; Microgravity; Sensorimotor Performance; Adaptation

20080014280 NASA Johnson Space Center, Houston, TX, USA

The Effect of Habitual Smoking on VO2max

Wier, Larry T.; Suminski, Richard R.; Poston, Walker S.; Randles, Anthony M.; Arenare, Brian; Jackson, Andrew S.; [2008]; 4 pp.; In English; ACSM's 55th Annual Meeting, 28-31 May 2008, Indianapolis, IN, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

VO2max is associated with many factors, including age, gender, physical activity, and body composition. It is popularly believed that habitual smoking lowers aerobic fitness. PURPOSE: to determine the effect of habitual smoking on VO2max after controlling for age, gender, activity and BMI. METHODS: 2374 men and 375 women employed at the NASA/Johnson Space Center were measured for VO2max by indirect calorimetry (RER>=1.1), activity by the 11 point (0-10) NASA Physical Activity Status Scale (PASS), BMI and smoking pack-yrs (packs day*y of smoking). Age was recorded in years and gender was coded as M=1, W=0. Pack.y was made a categorical variable consisting of four levels as follows: Never Smoked (0), Light (1-10), Regular (11-20), Heavy (>20). Group differences were verified by ANOVA. A General Linear Models (GLM) was used to develop two models to examine the relationship of smoking behavior on VO2max. GLM #1(without smoking) determined the combined effects of age, gender, PASS and BMI on VO2max. GLM #2 (with smoking) determined the added effects of smoking (pack.y groupings) on VO2max after controlling for age, gender, PASS and BMI. Constant errors (CE) were calculated to compare the accuracy of the two models for estimating the VO2max of the smoking subgroups. RESULTS: ANOVA affirmed the mean VO2max of each pack.y grouping decreased significantly ($p<0.01$) as the level of smoking exposure increased. GLM #1 showed that age, gender, PASS and BMI were independently related with VO2max ($R2 = 0.642$, $SEE = 4.90$, $p<0.001$). The added pack.y variables in GLM #2 were statistically significant (R2 change = 0.7%, $p<0.01$). Post hoc analysis showed that compared to Never Smoked, the effects on VO2max from Light and Regular smoking habits were -0.83 and -0.85 ml.kg- 1.min-1 respectively ($p<0.05$). The effect of Heavy smoking on VO2max was -2.56 ml.kg- 1.min-1 ($p<0.001$). The CE s of each smoking group in GLM #2 was smaller than the CE s of the smoking group counterparts in GLM #1. CONCLUSIONS: After accounting for the effects of gender, age, PASS and BMI the effect of habitual smoking on reducing VO2max is minimal, about 0.85 ml/kg/min, until the habit exceeds 20 pack.y at which point an additional decrease of 1.71 ml/kg/min is noted. Adding pack.y data improves the accuracy of predicting the VO2max of smokers.

Author

Habits; Physiological Effects; Tobacco; Oxygen Consumption

20080014281 NASA Johnson Space Center, Houston, TX, USA

Health and Safety Benefits of Small Pressurized Suitport Rovers as EVA Surface Support Vehicles

Gernhardt, Michael L.; Abercromby, Andrew F. J.; [2008]; 15 pp.; In English; 79th Annual Scientific Meeting of the Aerospace Medical Association, 11-15 May 2008, Boston, MA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Pressurized safe-haven providing SPE protection and decompression sickness (DCS) treatment capabilities within 20

mins at all times. Up to 50% reduction in time spent in EVA suits (vs. Unpressurized Rovers) for equal or greater Boots-on-Surface EVA exploration time. Reduces suit-induced trauma and provides improved options for nutrition, hydration, and waste-management. Time spent inside SPR during long translations may be spent performing resistive and cardiovascular exercise. Multiple shorter EVAs versus single 8 hr EVAs increases DCS safety and decreases prebreathe requirements. SPRs also offer many potential operational, engineering and exploration benefits not addressed here.
Derived from text
Surface Vehicles; Decompression Sickness; Extravehicular Activity; Physical Exercise; Nutrition; Health; Hydration

20080014282 NASA Johnson Space Center, Houston, TX, USA
Spaceflight-induced Bone Loss: Is there a Risk for Accelerated Osteoporosis after Return?
Sibonga, Jean; [2008]; 79 pp.; In English; Space Physiology - Spring 2008, 3 Apr. 2008, Galveston, TX, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014282

The evidence-to to-date suggests that the rapid rate of site-specific bone loss in space, due to the unbalanced stimulation of bone resorption, may predispose crew members to irreversible changes in bone structure and microarchitecture. No analyses conducted in the postflight period to assess microarchitectural changes. There is no complete analysis of skeletal recovery in the postflight period to evaluate the structural changes that accompany increases in DXA aBMD. Postflight analyses based upon QCT scans performed on limited crew members indicate reductions in hip bone strength and incomplete recovery at 1 year. No recovery of trabecular vBMD after 1 year return (HRP IWG). Time course of bone loss in space unknown.
Derived from text
Musculoskeletal System; Bone Demineralization; Osteoporosis; Postflight Analysis; Bones; Flight Crews

20080014283 NASA Johnson Space Center, Houston, TX, USA
Spaceflight-induced Bone Loss: Countermeasures and Their Evaluations
Sibonga, Jean D.; [2008]; 58 pp.; In English; Space Physiology - Spring 2008, 10 Apr. 2008, Galveston, TX, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014283

The learning objectives of this viewgraph presentation are to: (1) Understand the biomedical effects of spaceflight and their associated health risks. (2) Understand how the 'Factor of Risk' for fracture can be calculated in the adult skeleton for space travel. and (3) Understand how various countermeasures [CMs] influence the Factor of Risk.
CASI
Countermeasures; Musculoskeletal System; Space Flight; Bone Demineralization; Osteoporosis; Physiological Effects; Gravitational Physiology; Aerospace Medicine

20080014286 NASA Johnson Space Center, Houston, TX, USA
The Effects of Terrain and Navigation on Human Extravehicular Activity Walkback Performance on the Moon
Norcross, Jason; Stroud, Leah C.; Schaffner, Grant; Glass, Brian J.; Lee, Pascal C.; Jones, Jeff A.; Gernhardt, Michael L.; [2008]; 15 pp.; In English; 79th Annual Scientific Meeting of the Aerospace Medical Association, 11-15 May 2008, Boston, MA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Results of the EVA Walkback Test showed that 6 male astronauts were able to ambulate 10 km on a level treadmill while wearing a prototype EVA suit in simulated lunar gravity. However, the effects of lunar terrain, topography, and real-time navigation on ambulation performance are unknown. Primary objective: To characterize the effect of lunar-like terrain and navigation on VO2 and distance traveled during an unsuited 10 km (straight-line distance) ambulatory return in earth gravity.
Derived from text
Extravehicular Activity; Activity (Biology); Navigation; Lunar Topography; Terrain; Human Reactions; Lunar Gravitation

20080014469 New Mexico State Univ., Las Cruces, NM USA
Corrections to the Shapiro Equation used to Predict Sweating and Water Requirements
Gonzalez, Richard R; Cheuvront, Samuel N; Goodman, Daniel A; Blanchard, Laurie A; Berglund, Larry G; Sawka, Michael N; Jan 2008; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475891; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475891

The objective of this project was to cross validate the original Shapiro equation (OSE) which was developed to predict

rate of sweat loss over wide environmental conditions, clothing systems, and metabolic activities. activities. Within the limits of the data, the equation has been shown to be a valid estimator of sweating rate for a variety of heat stress exposures up to 2 h and work rates limited to less than 450 W. The second objective was to develop a new prediction algorithm or correct the previous one so that reliable fluid replacement guidelines using such equations can be constructed in the future for more extended work times greater than just 2 h, the exposure time in the original study. The need to develop a new prediction equation stems from results of recent studies at USARIEM that revealed that the original equation embedded in a Heat Strain Decision Aide (HSDA) computer model over predicts actual sweating responses over wide environmental extremes, work rates, and work periods. Overpredictions of sweating rate (and the required fluid intake to fully replace the expected sweat loss) can lead to over-hydration problems. A USARIEM database was secured consisting of 101 volunteer subjects who completed experiments at various activity levels over wide environmental ambient conditions. Subjects wore various military clothing systems including chemical protective clothing and body armor. Each element of the comprehensive heat balance equation was analyzed. Data were analyzed using fuzzy piecewise linear and nonlinear regression analyses to establish appropriate change points in sweat loss per time points. It was established that the original Shapiro algorithm predicts markedly high values in sweating rates. The most important finding of the current study and recommendation is to substitute or modify the current HSDA program with a corrected algorithm.
DTIC
Correction; Equations; Perspiration; Physiological Effects; Water

20080014549 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA
The Effects of Diesel Exhaust and Stress on the Acute Phase Response and in the Chemically Intolerant
Fideler, Nancy; Aug 2007; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0537
Report No.(s): AD-A476085; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476085

Exposures to diesel exhaust (DE) and other petrochemical combustion products were the exposures reported by the greatest percentage of all Gulf War veterans (GWV). Along with diesel exhaust and other chemical exposures, psychological stress has been implicated in the onset of unexplained symptoms such as chemical sensitivity among GWV. The purpose of the proposed study is to test a model for chemical sensitivity in GWV, in which simultaneous acute exposures to DE and psychological stress cause increased symptoms via the acute phase response (APR), in susceptible individuals. Individuals who are low or high in the susceptibility factor of chemical intolerance (CI) will be exposed to DE either with or without a public speaking task, an acute psychological stressor. 100 subjects have completed the protocol. Preliminary data indicates that relative to clean air, subjects report a small increase in symptoms following the onset of diesel exposure. Analysis of blood cell counts and differentials and soluble markers reveal the reliability of the analytic techniques and compare favorably to normative reference ranges. Analysis of induced sputum cell differential counts showed that a minority of subjects (N=19) were able to produce two adequate sputum samples. Tests of study hypotheses are pending completion of assays for soluble markers in collected blood, sputum and nasal lavage samples, and ongoing statistical analysis and interpretation of results.
DTIC
Combustion Products; Diesel Engines; Exhaust Emission; Exhaust Gases; Frequency Response; Phase Shift

20080014832 Wyle Labs., Inc., Houston, TX, USA
Metabolic Expenditures During Extravehicular Activity: Spaceflight versus Ground-based Simulation
Klein, Jill; Conkin, Johnny; Gernhardt, Michael; Srinivasan, Ramachandra; [2008]; 15 pp.; In English; 79th Annual Scientific Meeting of the Aerospace Medical Association, 11-15 May 2008, Boston, MA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In general metabolic rates tend to be higher in NBL than in flight: a) Restraint method dependent; b) Significant differences between the NBL and flight for BRT and APFR (buoyancy effects); and c) No significant difference between NBL and flight for free float and SRMS/SSRMS operations. The total metabolic energy expenditure for a given task and for the EVA as a whole are similar between NBL and flight: a) NBL metabolic rates are higher, but training EVAs are constrained to 5 hours; and b) Flight metabolic rates are lower, but the EVAs are typically an hour or more longer in duration. NBL metabolic rates provide a useful operational tool for flight planning. Quantifying differences and similarities between training and flight improves knowledge for preparation of safe and efficient EVAs.
Derived from text
Metabolism; Flight Operations; Extravehicular Activity; Constraints; Buoyancy; Spacecrews

20080014853 NASA Johnson Space Center, Houston, TX, USA

Feasibility of Suited 10-km Ambulation 'Walkback' on the Moon

Norcross, Jason; Lee, Lesley; DeWitt, John K.; Klein, Jill; Wessell, James; Gernhardt, Michael L.; [2008]; 17 pp.; In English; 79th Annual Scientific Meeting of the Aerospace Medical Association, 12-15 May 2008, Boston, MA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews a study that examined the feasibility of having astronauts walk about 10 kilometers to the base in the event of a breakdown of the lunar rover. This was done in part to examine the possibility of having a single rover on the lunar exploration missions. Other objectives of the study are to: (1) Understand specific biomedical and human performance limitations of the suit compared to matched shirt-sleeve controls; (2) Collect metabolic and ground-reaction force data to develop an EVA simulator for use on future prebreathe protocol verification tests (3) Provide data to estimate consumables usage for input to suit and portable life support system (PLSS) design (4) Assess the cardiovascular and resistance exercise associated with partialgravity EVA for planning appropriate exploration exercise countermeasures

CASI

Astronauts; Human Performance; Moon; Physical Exercise; Space Suits; Walking; Lunar Logistics

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*.

20080014807 NASA Johnson Space Center, Houston, TX, USA

International Space Station Environmental Control and Life Support System Acceptance Testing for the Pressurized Mating Adapters

Williams, David E.; [2008]; 10 pp.; In English; International Conference on Environmental Systems, 29 Jun. - 3 Jul. 2008, San Francisco, CA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 401769.06.01.01.01

Report No.(s): 08ICES-0230; Copyright; Avail.: Other Sources

The International Space Station (ISS) Pressurized Mating Adapters (PMAs) Environmental Control and Life Support (ECLS) System is comprised of three subsystems: Atmosphere Control and Supply (ACS), Temperature and Humidity Control (THC), and Water Recovery and Management (WRM). PMAs 1 and 2 flew to ISS on Flight 2A and Pressurized Mating Adapter (PMA) 3 flew to ISS on Flight 3A. This paper provides a summary of the PMAs ECLS design and a detailed discussion of the ISS ECLS Acceptance Testing methodologies utilized for the PMAs.

Author

Environmental Control; International Space Station; Life Support Systems; Adapters; Pressurizing; Aerospace Systems; Spacecraft Design

20080015491 Emory Univ., Atlanta, GA USA

Grounding Symbolic Operations in Modality-Specific Processing

Barsalou, Lawrence W; Barbey, Aaron; Brasfield, Joy L; Finkelstein, Shlomit; James, Andrew; Hu, Xiaoping; Liu, Zhaohui; Santos, Ava; Wilson, Christine; Gries, Stefan; Martin, Alex; Simmons, Kyle; Jul 2007; 67 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-7256; Proj-DRPA

Report No.(s): AD-A475839; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475839

The research performed under this contract assessed whether fundamental symbolic operations-predication, conceptual combination, and the representation of abstract concepts-arise from the simulation of modality-specific states in the brain. Traditionally, symbolic operations have been widely assumed to arise from the manipulation of amodal symbols. Indeed, researchers often assume that symbolic operations could only result in this latter way. Recent research on grounded cognition, however, has proposed that symbolic operations, in principle, could arise from modality-specific simulation. The experiments performed here offer preliminary evidence that they do.

DTIC

Cognition; Electrical Grounding; Simulation; Symbols

59
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*.

20080015430 NASA Langley Research Center, Hampton, VA, USA
Using an Adjoint Approach to Eliminate Mesh Sensitivities in Computational Design
Nielsen, Eric J.; Park, Michael A.; [2006]; 10 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015430

An algorithm for efficiently incorporating the effects of mesh sensitivities in a computational design framework is introduced. The method is based on an adjoint approach and eliminates the need for explicit linearizations of the mesh movement scheme with respect to the geometric parameterization variables, an expense that has hindered practical large-scale design optimization using discrete adjoint methods. The effects of the mesh sensitivities can be accounted for through the solution of an adjoint problem equivalent in cost to a single mesh movement computation, followed by an explicit matrix-vector product scaling with the number of design variables and the resolution of the parameterized surface grid. The accuracy of the implementation is established and dramatic computational savings obtained using the new approach are demonstrated using several test cases. Sample design optimizations are also shown.
Author
Design Analysis; Computational Grids; Algorithms; Design Optimization; Vectors (Mathematics)

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.

20080014334 NASA Langley Research Center, Hampton, VA, USA
Interactive Visualization of Parking Orbits Around the Moon: An X3D Application for a NASA Lunar Mission Study
Murphy, Douglas G.; Qu, Min; Salas, Andrea O.; July 31, 2006; 6 pp.; In English; 2006 SIGGRAPH-33rd International Conference and Exhibition on Computer Graphics and Interactive Techniques, 31 Jul. - 3 Aug. 2006, Boston, MA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 986249.01.11.04; Copyright; Avail.: CASI: A02, Hardcopy

The NASA Integrated Modeling and Simulation (IM&S) project aims to develop a collaborative engineering system to include distributed analysis, integrated tools, and web-enabled graphics. Engineers on the IM&S team were tasked with applying IM&S capabilities to an orbital mechanics analysis for a lunar mission study. An interactive lunar globe was created to show 7 landing sites, contour lines depicting the energy required to reach a given site, and the optimal lunar orbit orientation to meet the mission constraints. Activation of the lunar globe rotation shows the change of the angle between the landing site latitude and the orbit plane. A heads-up-display was used to embed straightforward interface elements.
Author
Three Dimensional Models; Computerized Simulation; Parking Orbits; Computer Graphics; Internet Resources; Moon; Space Missions; Lunar Orbit and Landing Simulators; Scientific Visualization; Distributed Processing

20080014409 Naval Research Lab., Washington, DC USA
Documenting Xenon's Page_Alloc Module
Kirby, Jr , James; McDermott, John; Kang, Myong; Montrose, Bruce; Dec 10, 2007; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475753; NRL/MR/5540-07-9093; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475753

One of the critical assurance requirements for achieving medium or high assurance is a requirement for significant modularity in design and implementation. As part of the Xenon effort to create a secure Xen with a medium to high degree of assurance, we have embarked on its remodularization, a documented decomposition into well-defined pieces with well-defined relationships among them. This remodularization of Xen is based on the information hiding principle. Associated

with an information hiding module may be a provided interface, a set of public programs (e.g., functions, subroutines, macros) that programs outside the module can use to accomplish their work. Documentation of a module's provided interface serves as a contract between the module's users and its developers. This report documents the decomposition of the Xen page_alloc module and the specification of the provided interface of each of its submodules.
DTIC
Computer Programming; Computer Programs; Construction; Modularity; Security; Software Engineering

20080014410 Naval Research Lab., Washington, DC USA
A Unified Specification of Behavior for Requirements and Design
Kirby, Jr, James; Dec 10, 2007; 174 pp.; In English
Report No.(s): AD-A475754; NRL/MR/5540-07-9094; XB-NRL/MR/5540; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475754

It would be useful to write one description of software behavior to serve both requirements and design. Having one description could reduce effort by eliminating the work of developing two descriptions and keeping them consistent throughout development and maintenance. It would also eliminate the inconsistency inherent in having two descriptions, a fertile source of error. A question paramount to software engineers is 'Could one description of behavior for a real system serve both requirements and design?' The purpose of the present document is to answer that question by producing one such description of the software behavior of a real system. The specification presented here is based upon behavioral specifications extracted from function and abstract interface specifications developed by Paul Clements, Alan Parker, Kathryn Heninger Britton, David Parnas, John Shore, Stuart Faulk, Bruce Labaw, and David Weiss.
DTIC
Computer Programming; Requirements; Software Engineering; Specifications

20080014422 Naval Postgraduate School, Monterey, CA USA
Requirements to Create a Persistent, Open Source, Mirror World for Military Applications
Sanders, Kent; Dec 2007; 113 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475788; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475788

With many free simulations available to developers, it is desirable to marry the existing library and work of these simulations in an attempt to create a completely open source virtual reality environment to facilitate computer aided training and simulation. Key problems associated with developing a large scale Multiple User Virtual Environment (MUVE) are analyzed including appropriate server client architecture, terrain and object model formats, and overall project scalability. Solutions to these problems are proposed and analyzed, including using existing commercial and open source projects in development, using projects already deployed, or the feasibility of developing a new solution to meet the requirements of this thesis. Advantages, disadvantages, and possible military and educational uses for each of these free simulations and the associated persistent mirror worlds are also analyzed to recommend a direction of action for military and education simulation and training.
DTIC
Computer Aided Design; Military Technology; Mirrors; Simulation; Virtual Reality

20080014424 Air Force Research Lab., Edwards AFB, CA USA
Validation of Computational Fluid Dynamics Simulations for Realistic Flows (Preprint)
Davoudzadeh, Farhad; Dec 2007; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-4847
Report No.(s): AD-A475793; AFRL-PR-ED-TP-2007-438; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475793

No abstract available
Coding; Computational Fluid Dynamics; Fluid Flow; Simulation

20080014443 Naval Postgraduate School, Monterey, CA USA

Assessing the Acceptance and Functional Value of the Asymmetrical Software Kit (ASK) at the Tactical Level

Hopewell, Peter H; Dec 2007; 95 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475834; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475834

The Asymmetrical Software Kit (ASK) is a software package built for U.S Army Special Operations Command (USASOC). It is designed to greatly expand and digitize the Intelligence Preparation of the Battlefield (IPB) process for Special Forces units. The purpose of this Thesis is to thoroughly evaluate the Tactical user's acceptance of this technological innovation. Technology Acceptance Model, which psychometrically measures users perceptions of ease-of-use and utility to predict their intention to use the software, was applied in this analysis. The test population for this user acceptance survey is the Tactical (Group and below) level user of the ASK. These are the Special Forces Intel Sergeants (18F's) on the Special Forces A-Teams (ODAs), and the Military Intelligence personnel at the Battalion and Group S2 (Staff Intelligence) sections. Respondents completed an anonymous, online survey on their impressions of the ASK. The questions were focused on system usability and user acceptance in a military setting. Overall, the models used in this study showed an acceptable level of fit with the Tactical enduser's usability and acceptance assessments and exhibited satisfactory explanatory power. Users showed marked trends in response to questions concerning training, command involvement, and system availability. Qualitative input included a number of responses about the idiosyncrasies of certain programs, and the lack of high speed computers to run complex GIS queries. The findings from this study should provide some valuable insights to Program Managers about systems evaluation, and clarify how USASOC can design full spectrum software fielding to foster technology acceptance and use at the Tactical level.

DTIC

Asymmetry; Computer Programs; Intelligence; Kits; Military Technology; Software Development Tools; User Requirements

20080014477 Naval Postgraduate School, Monterey, CA USA

Design and Implementation of Wiki Services in a Multilevel Secure Environment

Ong, Kar L; Dec 2007; 142 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475912; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475912

The Monterey Security Architecture (MYSEA) provides a distributed multilevel secure networking environment where authenticated users can securely access data and services at different security classification levels. The MYSEA framework utilizes both commercial-off-the- shelf (COTS) products and specialized secure high assurance components that enforce multilevel security (MLS) policy. Some collaboration among MYSEA users is enabled through the use of the Web-based Distributed Authoring and Versioning (WebDAV) mechanism. This thesis extends the existing collaboration capability in MYSEA to include hypertext content-based collaborative authoring and information sharing through the use of the increasingly popular wiki technology. This is accomplished by porting a publicly available wiki engine to run on a proprietary operating system hosting the MYSEA server. Through a systematic selection process, TWiki was chosen as the wiki engine for MYSEA. A three-stage porting methodology was used to aid in troubleshooting porting errors. Functional and security tests were performed to ensure that the wiki engine operates properly while being constrained by the underlying Mandatory Access Control (MAC) and Discretionary Access Control (DAC) enforcement mechanisms. This research is synergistic with the cross-domain information sharing emphasis fostered under various R&D programs in the DoD and intelligence communities.

DTIC

Environments; Internets; Security

20080014482 Naval Postgraduate School, Monterey, CA USA

Discrete-Event Simulation with Agents for Modeling of Dynamic Asymmetric Threats in Maritime Security

Ng, Chee W; Dec 2007; 99 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475925; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475925

Maritime security has become an important security focus area due to the impact that piracy and terrorism have on the global economy. There are many studies on detecting and engaging asymmetric threats in ports and waterways. However the threats are typically modeled too simply with predefined or random paths and fixed responses. There is a need to model representing dynamic asymmetric threat behaviors so that future threat-response models will be a more realistic evaluation against a dynamically adaptive foe. Discrete-event simulation (DES) was used to simulate a typical port-security, local, waterside-threat response model and to test the adaptive response of asymmetric threats in reaction to port-security procedures,

while a multi-agent system (MAS) was used to provide the complex adaptive behaviors for our threats. Cover and dynamic pathfinding were used with the sensor framework in Simkit to enhance the spatial interactivity of the agents. This study found that MAS asymmetric threats demonstrate greater flexibility of behaviors and show potential for adaptability. These dynamic asymmetric threats will enable simulation of a wider variety of maritime-threat scenarios and play an important part in improving the plans for future maritime force and infrastructure configurations.
DTIC
Asymmetry; Security; Simulation; Terrorism

20080014487 Naval Postgraduate School, Monterey, CA USA
An Integrated Architecture to Support Hastily Formed Network (HFN)
Hwee, Lim M; Dec 2007; 111 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475932; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475932

This thesis analyzes the nature of Hastily Formed Networks (HFN) and develops a framework and architecture for effective collaboration needs. The analysis considers review of a spectrum of Commercial off-the-shelf (COTS) hardware (including Mobile Command and Control (C2) center and network hardware) and software (i.e., resource optimizing tools) that could support a wider continuum of humanitarian and crisis-relief missions as well as ad-hoc anti-terrorist threats missions Military and Non- Governmental Organization (NGO) participation is considered. Various phases of disasters or incidents are studied and suitable Information and Communications Technologies (ICT) and capabilities are identified to improve the effectiveness and efficiency of collaborative operations.
DTIC
Architecture (Computers); Networks

20080014495 California State Univ., Long Beach, CA USA
Strategic Mobility 21. Collaborative Regional Web Portal Design, Development and Documentation
Mallon, Lawrence G; Carson, Steve; Dec 31, 2007; 80 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-06-C-0060
Report No.(s): AD-A475955; CSU-0013; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475955

This report documents the research and initial development of a Web Portal by the strategic Mobility 21 (SM21) program, including defining requirements for an SM21 Web Portal and reviewing current literature and technology associated with Web Portals supporting the transportation and distribution sectors. This document provides an example of a specific service interface that enables collaboration between military and transportation planners and military ship load planners. This paper also describes how the SM21 program is using Web 2.0 collaboration technologies including Wikis, Blogs, and Modeling, Simulation and Analysis tools to address a key program area identified as having significant capability gaps: a regional planning interface that makes data, models, and analyses available to all stakeholders in an interactive and configurable manner. An underlying theme of this report is the merging of Web 2.0 and knowledge management technologies with Service Oriented Architecture.
DTIC
Marine Transportation; Military Operations; Mobility; Planning; Regional Planning; Software Development Tools; Transportation

20080014497 Naval Postgraduate School, Monterey, CA USA
Little by Little Does the Trick: Design and Construction of a Discrete Event Agent-Based Simulation Framework
Matsopoulos, Alexandros; Dec 2007; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475959; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475959

Simulation is one of the most widely used techniques in operations research. In the military context, agent-based simulations have been extensively used by defense agencies worldwide. Despite the numerous disadvantages and limitations associated with time- stepping, most of the combat-oriented agent-based simulation models are time-step implementations. The Discrete Event Scheduling (DES) paradigm, on the other hand, is free of these disadvantages and limitations. The scope of this thesis is to design and implement a library of reusable software components that will facilitate building combat-oriented agent-based simulation models by extending the Simkit DES toolkit. We describe our design of what an agent-based DES

implementation framework should look like. We show that the extensive use of Java interfaces allows the user to implement different models and scenarios without being constrained by pre-built components. We also enhance Simkit's existing Sensing model by introducing a Situational Awareness model and a Behavioral model. Finally, we build a small agent-based model using the component architecture to demonstrate the library's functionality.
DTIC
Architecture (Computers); Combat; Computerized Simulation; Construction; Simulation

20080014500 Naval Postgraduate School, Monterey, CA USA
Tactical Plan Generation Software for Maritime Interdiction Using Conceptual Blending Theory
Tan, Kian M T; Dec 2007; 111 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475964; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475964

This paper describes a plan generation software for maritime interdiction tactical operation using conceptual blending theory (CBT) and software blending mechanism. CBT explains how human think using mental spaces and mental operators. This paper uses CBT to model Boyd's Observation- Orientation- Decision-Act Loop Theory, a mental process used by military commanders to make decision. Bio-inspired operators are used to monitor cues from the real world Expert's experiences were captured using a similar strategy implemented in the threat assessment model created by Liebhaber and Feher. Probability Estimates of Events (PEoE) are used to represent the significance of each possible tactic used by potential threats. Several PEoE are used to represent the mental patterns used to recognize a threat situation. Finally, decision is derived using linear assignment, an optimality approach that considers threat attack probability, goals and interdiction resource effectiveness. Experienced naval warfare officers have given positive feedback on the results presented and commented that the model resembles the cognitive process of a decision-maker in tactical plan generation. The model has also been tested in a Simkit-based simulator to coordinate patrol craft's maritime interdiction process.
DTIC
Computer Programming; Mixtures; Software Engineering

20080014532 Naval Postgraduate School, Monterey, CA USA
Modeling the Transformational Communications System Urban Land Mobile Satellite Channel
Gillespie, Timothy A; Dec 2007; 225 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476041; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476041

The success of the Transformational Communications System depends on providing high quality communications to the mobile user in any environment. A hurdle to this success is the urban Land Mobile Satellite Channel which experiences frequent and extended deep signal fades due to shadowing by man-made structures. The problem is exacerbated for the Communications-on-the-Move channel due to use of a directional antenna. This dissertation evaluates available empirical test data, develops an improved channel model and investigates mitigation strategies focused on improving channel throughput and latency. The improved channel model is developed using continuous transmission mixed-Gaussian hidden Markov models and Expectation-Maximization parameter estimation. The improved model provides a better match to empirical data than previous efforts. Two fade mitigation strategies are examined. The first strategy involves modification of packet routing protocols. A detailed, time-based network simulation is developed for performance assessment. Results show substantial reductions in packet latency under a broad range of conditions. The second mitigation strategy is based on fade prediction using real-time adaptive linear filters. Signal inputs from directional and non-directional antennas are investigated. Initial results indicate a requirement for a high temporal resolution input signal.
DTIC
Cities; Communication Satellites; Satellite Communication; Telecommunication

20080014536 Naval Postgraduate School, Monterey, CA USA
Software Architecture: Managing Design for Achieving Warfighter Capability
Naegle, Brad; Petross, Diana; Oct 12, 2007; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476050; NPS-GSBPP-07-012; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476050

This research analyzes the problems associated with poorly performing DoD software-intensive systems focusing on the critical software architectural design process. DoD's software-intensive systems continue to experience software related

performance supportability and security shortfalls resulting in system software failures costly and resource-intensive support requirements and security vulnerabilities that negatively impact the warfighter missions. As software performance is significantly determined by the software architecture this research examined current practices for controlling and influencing the system software design process metrics and analyzed other available design-analysis methodologies for applicability to the DoD acquisition process. Specifically methods were analyzed for the ability to integrate the user-oriented Joint Capabilities Integration and Development System (JCIDS) the Systems Engineering Process (SEP) and the DoD Acquisition Management Model.
DTIC
Architecture (Computers); Computer Programming; Software Engineering; Systems Engineering

20080014540 Naval Postgraduate School, Monterey, CA USA
A Study on Modeling Approaches in Discrete Event Simulation Using Design Patterns
Kim, Leng Koh; Dec 2007; 115 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476054; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476054

Many discrete event simulation (DES) systems have been built using Simkit as the underlying infrastructure. Simkit advocates a modeling paradigm where DES applications can be rapidly built with simple, independent modules that are assembled in a component-like fashion. This modeling paradigm encompasses several modeling approaches active role of events, entities as independent components, and chaining components to enable interactivity that are excellent ways of building a DES system. This thesis is inspired by the great work achieved in the mechanisms of the underlying infrastructure. Detailed study of the enabling mechanisms and design patterns was conducted. Design patterns are proven design solutions that embody best practices of software-design concepts; this thesis proposes new design that incorporates suitably identified design patterns into the mechanisms of the infrastructure to bring out the elegance of design, robustness, and maintainability that heighten the maturity of a simulation engine. The result of this research work has been a success; several design patterns have been identified and incorporated into a new design of the mechanisms behind a simulation engine. A DES application that was built for the SEAs project was able to switch over to run on the new simulation engine while keeping its business model intact.
DTIC
Computer Programming; Simulation; Software Engineering

20080014650 Carnegie-Mellon Univ., Pittsburgh, PA USA
Distributed System Security via Logical Frameworks (SeLF)
Bauer, Lujo; Pfenning, Frank; Reiter, Michael; Chaudhuri, Kaustav; Garg, Deepak; Garriss, Scott; McCune, Jon; Ley-Wild, Ruy; Jan 14, 2008; 6 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0724
Report No.(s): AD-A476104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We conducted a research program with the goal of advancing security in distributed systems via the application of logical frameworks. Our work targeted multiple facets of the life-cycle of a distributed system, ranging from design through execution, and from sound mechanism design through sound policy enforcement. It consisted of three major interconnected thrusts. First, we investigated how to exploit existing technologies to mechanically reason about security policies as specified in a logical framework. This closed an important security gap, helping users and managers understand the consequences of their policies. Second, we demonstrated the use of logical frameworks for encoding and enforcing access-control policies in a practical distributed system. Access-control mechanisms today, whether it be physical keys for doors or password protection for computer accounts, reflect access-control policies that are explicit only in the manual procedures of the organization that manages these resources. As such, any change in policy, e.g., creating a new computer account, or permitting a person to unlock a door, is effected through a manual process. We utilized logical frameworks to encode organizational policies within computer systems, thereby harnessing the power of these frameworks to support the management and enforcement of access-control policy, and gaining security and flexibility by doing so. We demonstrated this capability in a ubiquitous computing test-bed at Carnegie Mellon. Third, we developed and implemented a framework for the specification of distributed and concurrent systems and their implementations, specifically targeting our test-bad architecture. This work extends a previous collaboration between NRL and Carnegie Mellon that resulted in the design of CLF, an innovative logical language for the specification of concurrent systems. CLF incorporates ideas from logical frameworks, linear logic, and monads into an expressive meta-language.
DTIC
Access Control; Numerical Control; Policies; Security

20080014653 Mitre Corp., McLean, VA USA

Quality Assessment of Trustworthiness of AFMC Acquisition Data

Karhoff, Herman L; Sep 2007; 40 pp.; In English

Contract(s)/Grant(s): FA8721-07-C-0001; Proj-0307754001

Report No.(s): AD-A476118; MTR-070281; No Copyright; Avail.: Defense Technical Information Center (DTIC)

To become a more efficient and effective joint-expeditionary force, the Air Force (AF) and its business partners are adopting an enterprise view that optimizes resources (i.e., people, process, and technology). To achieve this end, the AF has embarked upon an aggressive enterprise Information Technology (IT) modernization strategy. A major challenge with the planning and implementation of transformation/migration strategies is the ability to determine the quality of AF data. A basic premise is that data of unknown quality is inherently untrustworthy. Few would disagree with the premise that good quality data (i.e., timeliness and accuracy) is critical to aiding AF leadership in making the right decisions. How can these decision makers trust the data if they do not have a means to assess and measure their data quality? Is it impossible to measure something that is not understood, and how do you manage something that cannot be measured? These are some of the key questions MITRE seeks to answer in this Mission Oriented Investigation and Experimentation (MOIE) initiative. The purpose of this paper is two-fold: (1) to heighten awareness on the importance and impacts of data quality (DQ); and (2) to document (i.e., DQ assessment methodology, measurement techniques and assessment criteria) the findings and outcomes from this MOIE research. The approach is to apply semantics and heuristics (i.e., utilization of architectures, methodologies, state-of-the art software tools, implementation techniques, and production test data) in exploring capabilities that enhance data quality and thus improve the quality of decisions made with enterprise data. AF production data (e.g., invoice transactions) was used to verify and validate the MOIE hypothesis, assumptions, and findings.

DTIC

Data Acquisition; Quality; Technology Assessment

20080015419 Library of Congress, Washington, DC USA

Network Centric Warfare: Background and Oversight Issues for Congress

Wilson, Clay; Jun 2, 2004; 40 pp.; In English

Report No.(s): AD-A476256; CRS-RL32411; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Network Centric Warfare (NCW) is a key component of DOD planning for transformation of the military. NCW relies on computer processing power and networked communications technology to provide a shared awareness of the battle space for U.S. forces. Proponents say that a shared awareness increases synergy for command and control, resulting in superior decision-making, and the ability to coordinate complex military operations over long distances for an overwhelming war-fighting advantage. NCW technology saw limited deployment in Afghanistan and, more recently, increased deployment in Operation Iraqi Freedom (OIF). Several DOD key programs are now underway for deployment throughout all services.

DTIC

Military Operations; Command and Control; Warfare; Interprocessor Communication

20080015486 Stanford Univ., Stanford, CA USA

Polymorphous Computing Architectures

Horowitz, Mark; Dec 12, 2007; 95 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F29601-03-2-0117; Proj-ARPA

Report No.(s): AD-A475813; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475813

We describe the architecture and hardware implementation of a coarse grain parallel computing system with flexibility in both memory and processing elements. The memory subsystem supports a wide range of programming models efficiently, including cache coherency, message passing, streaming, and transactions. The memory controller implements these models using metadata stored with each memory block. Processor flexibility is provided using Tensilica Xtensa cores. We use Xtensa processor options and Tensilica Instruction Extension language (TIE) to provide additional computational capabilities, to define additional memory operations needed to support our controller, and to add VLIW instructions for increased efficiency. In our implementation, two processors share multiple memory blocks via a load/store unit and a crossbar switch. These dual processor tiles are grouped into quads that share a memory protocol controller. Quads connect to one another and to the off-chip memory controller via a mesh-like network. We describe the design of each block in detail. We also describe our implementation of transactional memory. Transactional Coherence and Consistency (TCC) provides greater scalability than

previous TM architectures by deferring conflict detection until commit time and by using directories to reduce overhead. We demonstrate near linear scaling up to 64 processors with less than 5% overhead.
DTIC
Architecture (Computers); Computer Programming; Computer Storage Devices; Polymorphism

20080015579 Prometheus, Inc., Newport, RI USA
Radar Performance of Temporal and Frequency Diverse Phase-Coded Waveforms
Suvorova, Sofia; Moran, Bill; Kalashyan, Elena; Zulch, Peter; Hancock, Robert J; Jan 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475701; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475701

We explore the use of binary phase-coded waveforms encoded in frequency and temporally diverse modes for radar detection of targets in clutter. Specifically, in this paper we study the use of complementary binary phasecoded waveforms and compare their performance to other, more conventional, suites of waveforms. We also give an ambiguity calculation showing the effects of time and frequency separation.
DTIC
Coding; Frequencies; Radar Targets; Waveforms

62
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.

20080014436 Naval Postgraduate School, Monterey, CA USA
SecureCore Security Architecture: Authority Mode and Emergency Management
Levin, Timothy E; Bhaskara, Ganesha; Nguyen, Thuy D; Clark, Paul C; Benzel, Terry V; Irvine, Cynthia E; Oct 16, 2007; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): CNS-0430566; CNS-0430598
Report No.(s): AD-A475810; NPS-CS-07-012; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475810

This document describes research in the SecureCore project. It describes results in the integration of SP Authority Mode hardware security features into the SecureCore Software Security Architecture and the SecureCore Trusted Management Layer. The context of integration is described including the target security policy, transient trust requirements and rationale. The design for protecting secondary storage volumes, trusted channels, and emergency management is described. Design considerations and recommendations for future work are also included.
DTIC
Communication Networks; Computers; Emergencies; Logic Design; Management Methods; Security

20080014472 Naval Postgraduate School, Monterey, CA USA
Email Marketing for U.S. Army and Special Operations Forces (SOF) Recruiting
McGrath, III, George F; Dec 2007; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475899; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475899

U.S. Army and Special Operations Forces (SOF) Recruiters in the U.S. Army Recruiting Command (USAREC) currently use four prospecting strategies to recruit Future Soldiers. These include telephone, referral, face-to-face, and internet or e-mail prospecting. The four prospecting strategies have proven to be effective, but e-mail prospecting continues to remain the most underutilized. Ironically, e-mail prospecting is the most efficient strategy, yet most recruiters either refuse to try it or they use it incorrectly. This study demonstrates that U.S. Army and SOF Recruiters can use e-mail as a legitimate marketing tactic and a powerful tool. Chapter 1 sets forth the purpose of the study and the author's hypothesis. Chapter 2 discusses the four recruiting strategies that are being used by U.S. Army and SOF recruiters, with a concentration on e-mail prospecting. In Chapter 3, the author presents three case studies of organizations that successfully used e-mail marketing to increase customer recruitment: the Raleigh Recruiting Company, Digital Underground Credit Knowledge (DUCK9), and the Eastpoint Community Church. The first case study is the author's personal account of the e-mail marketing campaign he launched while

commanding the Raleigh Recruiting Company, U.S. Army, during FY 2006. By the end of the year, he had sent over 750,000 targeted e-mail newsletters to college students within his area of responsibility. Ten enlistments resulted from this e-mail campaign. Chapter 4 presents a model to demonstrate the efficiency of e-mail marketing compared with phone prospecting, and justifies an estimate that the Army could recruit roughly 2,300 more recruits each year with a nationwide e-mail campaign for under $600,000. The author recommends that USAREC implement a mass e-mail marketing campaign in 2008, and presents COAs for doing so. The final portion of the thesis is an appendix that provides additional strategies to assist USAREC with its e-mail marketing endeavors.
DTIC
Electronic Mail; Internets; Marketing; Military Operations; Military Personnel

20080014506 Naval Postgraduate School, Monterey, CA USA
A Study of the Seastar Underwater Acoustic Local Area Network Concept
Kersten, Bjorn E; Dec 2007; 177 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475979; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475979

This research considers the 'Seastar' concept of an underwater local-area network (LAN) having a central node and multiple peripheral nodes. The concept of operation for the Sea star LAN involves the delivery of large volumes of digital information from the peripheral nodes through direct acoustic communication links to a sophisticated central node for assimilation (e.g., beamforming, fusion). For a design range of 500 meters, link budget analysis in combination with parametric analysis evaluates physical-layer parameters including optimum carrier frequency, spectral bandwidth, modulation techniques, achievable bit rate, and energy budget. Performance data obtained from a prototype Seastar LAN constructed from existing acoustic modems guided the creation of a Seastar numerical simulation. Monte Carlo simulation studies examine the relative merits of networking strategies such as TDMA polling and token-based TDMA. Seastar is shown to meet the anticipated requirements for undersea LAN applications such as sensor networks, undersea vehicle swarms, and dive teams.
DTIC
Acoustics; Communication; Local Area Networks; Sound Transmission; Underwater Acoustics

20080014527 Naval Postgraduate School, Monterey, CA USA
Design Principles and Guidelines for Security
Levin, Timothy E; Irvine, Cynthia E; Benzel, Terry V; Bhaskara, Ganesha; Clark, Paul C; Nguyen, Thuy D; Nov 21, 2007; 40 pp.; In English
Contract(s)/Grant(s): CNS-0430566; CNS-0430598
Report No.(s): AD-A476035; NPS-CS-07-014; ISI-TR-648; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476035

This report provides a distillation, synthesis and organization of key principles for the construction of secure computing systems, and supports the analysis with examples where needed for clarity. Our conclusions reflect a broad range of previous related work including the landmark study by Saltzer and Schroeder and several subsequent reports. We found that some of the early design principles required re-examination due to, for example, advances in performance and extensibility as well as the effects of various new technologies. We focus on a concise summary articulation of the principles as they apply to the development of the most elemental components of a basic security system. The results are organized into several major categories: structure, logic and function, system lifecycle, and lessons learned.
DTIC
Computer Information Security; Design Analysis; Security

20080014715 Maryland Univ., College Park, MD USA
Measuring Traffic on the Wireless Medium: Experience and Pitfalls
Yeo, Jihwang; Banerjee, Suman; Agrawala, Ashok; Dec 17, 2002; 12 pp.; In English
Report No.(s): AD-A476336; CS-TR-4421; UMIACS-TR-2002-101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A number of measurement studies have examined traffic characteristics in wireless networks. Most of these measurements have been conducted from the wired portion of the network. In this paper we argue that such measurements are not sufficient to expose either the characteristics of the wireless medium or how such characteristics impact traffic patterns. While it is easier

to make consistent measurements in the wired part of a network, such measurements can not observe the significant vagaries present in the wireless medium itself. As a consequence constructing an efficient and accurate measurement system from a wireless vantage point is important but usually quite difficult. In our work we have explored the various issues in implementing such a system to monitor traffic in an 802.11 based wireless network. We identify different challenges in making such measurements and provide detailed experimental evidence in their supports. Our work shows that the wireless measurement allows us to infer much richer information about the medium characteristics than is possible with a measurements made on the wired part of the network. We apply our measurement technique to study the end-to-end wireless network delay. We show that wireless monitoring can effectively identify the causes of end-to-end delays.
DTIC
Accuracy; Communication Networks; Traffic

63
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*.

20080014435 Plymouth Univ., Plymouth, UK
Scaling Up of Action Repertoire in Linguisitic Cognitive Agents
Tikhanoff, Vadim; Cangelosi, Angelo; Fontanari, Jose F; Perlovsky, Leonid I; Jan 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-05-1-3060; FA8655-05-1-3031
Report No.(s): AD-A475809; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475809

We suggest the utilization of the Modeling Field Theory (MFT) to deal with the combinatorial complexity problem of language modeling in cognitive robotics. In new simulations we extend our previous MFT model of language to deal with the scaling up of the robotic agent's action repertoire. Simulations are divided into two stages. First agents learn to classify 112 different actions inspired by an alphabet system (the semaphore flag signaling system). In the second stage, agents also learn a lexical item to name each action. At this stage the agents will start to describe the action as a 'word' comprised of three letters (consonant - vowel - consonant). The results of the simulations demonstrate that: (i) agents are able to acquire a complex set of actions by building sensorimotor concept-models; (ii) agents are able to learn a lexicon to describe these objects/actions through a process of cultural learning; and (iii) agents learn actions as basic gestures in order to generate composite actions.
DTIC
Linguistics; Natural Language Processing; Robotics

20080014466 Naval Postgraduate School, Monterey, CA USA
The Implementation and Testing of a Robotic Arm on an Autonomous Vehicle
Jun, Hyun Il; Dec 2007; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475886; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475886

An articulated arm with three degrees of freedom is implemented and tested on an autonomous robot. Kinematic equations of motion for the arm are modeled and tested. A communication architecture is successfully implemented for wireless manual control of the arm. Visual and thermal cues are realized with an onboard camera and a collocated thermal sensor. Future work suggests investigations for full autonomous arm control without manual operator intervention based on sensor cues and visual scene correlation.
DTIC
Autonomy; Control; Kinematics; Robot Arms; Robots

20080014668 NuCrypt, LLC, Evanston, IL USA
After Quantum Keys are Distributed: Physical-Layer Encryption Aided by Optical Noise
Kanter, Gregory; Kumar, Prem; Jan 2007; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476157; No Copyright; Avail.: Defense Technical Information Center (DTIC)

AlphaEta is a practical physical encryption system: ' Performance similar to standard systems: ~1dB performance reduction ' Uses off the shelf components ' Use best available traditional cryptographic algorithms ' Improved security via

random noise / added complexity ' Known plain text attack low correlation statistical attack ' Lots of practical issues for Eve- How to phase-lock to a dense, noisy Mary ' Demonstrated Drop-in compatibility with all-optical fiber networks- 850km ' 2.5Gb/s data rates attainable now
DTIC
Cryptography; Optical Properties

20080015581 MacAulay-Brown, Inc., Dayton, OH USA
Smart Systems for Logistics Command and Control (SSLC2) Spiral Three
Matthews, Elizabeth; Cagle, Ron; Saintignon, Doug; Baumbarger, Brian; Johnson, Scott; Gallimore, Jennie J; Apr 2007; 103 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-04-C-6404; Proj-2830
Report No.(s): AD-A475729; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475729

Smart Systems for Logistics Command and Control (SSLC2) is an Air Force Research Laboratory Logistics Readiness Branch (AFRL/RHAL) Warfighter Readiness Research Division program to research, develop and apply technologies to collect the critical information required to effectively manage logistics resources in support of combat operations. SSLC2 developed recommendations and requirements to transition concepts to existing Air Force systems. The SSLC2 program was divided into three spirals. This report focuses on the research conducted during Spiral Three. The goal of SSLC2 Spiral 3 was to investigate ways to support logistic decision makers in complex flightline operations through the fusion of existing flightline information with smart sensor information. The focus was on providing support to Expeditors and Production Supervisors (ProSupers) on the flightline. This research focused on the fusion of information and presentation of the information through interactive visualizations to support situation awareness, decision making and collaboration.
DTIC
Command and Control; Information Systems; Logistics; Logistics Management; Support Systems

20080015647 NASA Marshall Space Flight Center, Huntsville, AL, USA
Video Guidance Sensor for Surface Mobility Operations
Fernandez, Kenneth R.; Fischer, Richard; Bryan, Thomas; Howell, Joe; Howard, Ricky; Peters, Bruce; February 10, 2008; 8 pp.; In English; STAIF 2008, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Robotic systems and surface mobility will play an increased role in future exploration missions. Unlike the LRV during Apollo era which was an astronaut piloted vehicle future systems will include teleoperated and semi-autonomous operations. The tasks given to these vehicles will run the range from infrastructure maintenance, ISRU, and construction to name a few. A common task that may be performed would be the retrieval and deployment of trailer mounted equipment. Operational scenarios may require these operations to be performed remotely via a teleoperated mode,or semi-autonomously. This presentation describes the on-going project to adapt the Automated Rendezvous and Capture (AR&C) sensor developed at the Marshall Space Flight Center for use in an automated trailer pick-up and deployment operation. The sensor which has been successfully demonstrated on-orbit has been mounted on an iRobot/John Deere RGATOR autonomous vehicle for this demonstration which will be completed in the March 2008 time-frame.
Author
Robotics; Guidance Sensors; Autonomy; Mobility; Deployment; Roving Vehicles; Spacecraft

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20080014258 NASA Langley Research Center, Hampton, VA, USA
Application of p-Multigrid to Discontinuous Galerkin Formulations of the Poisson Equation
Helenbrook, B. T.; Atkins, H. L.; AIAA Journal; [2006]; Volume 44, No. 3, pp. 566-575; In English; Original contains color illustrations
Contract(s)/Grant(s): 23-065-30-22; Copyright; Avail.: CASI: A03, Hardcopy

We investigate p-multigrid as a solution method for several different discontinuous Galerkin (DG) formulations of the Poisson equation. Different combinations of relaxation schemes and basis sets have been combined with the DG formulations

to find the best performing combination. The damping factors of the schemes have been determined using Fourier analysis for both one and two-dimensional problems. One important finding is that when using DG formulations, the standard approach of forming the coarse p matrices separately for each level of multigrid is often unstable. To ensure stability the coarse p matrices must be constructed from the fine grid matrices using algebraic multigrid techniques. Of the relaxation schemes, we find that the combination of Jacobi relaxation with the spectral element basis is fairly effective. The results using this combination are p sensitive in both one and two dimensions, but reasonable convergence rates can still be achieved for moderate values of p and isotropic meshes. A competitive alternative is a block Gauss-Seidel relaxation. This actually out performs a more expensive line relaxation when the mesh is isotropic. When the mesh becomes highly anisotropic, the implicit line method and the Gauss-Seidel implicit line method are the only effective schemes. Adding the Gauss-Seidel terms to the implicit line method gives a significant improvement over the line relaxation method.
Author
Algorithms; Galerkin Method; Poisson Equation; Multigrid Methods; Discretization (Mathematics); Relaxation Method (Mathematics); Discontinuity

20080014294 NASA Langley Research Center, Hampton, VA, USA
Arbitrary Steady-State Solutions with the K-epsilon Model
Rumsey, Christopher L.; Pettersson Reif, B. A.; Gatski, Thomas B.; AIAA Journal; [2006]; Volume 44, No. 7, pp. 1586-1592; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-065-30-14; Copyright; Avail.: CASI: A03, Hardcopy

Widely-used forms of the K-epsilon turbulence model are shown to yield arbitrary steady-state converged solutions that are highly dependent on numerical considerations such as initial conditions and solution procedure. These solutions contain pseudo-laminar regions of varying size. By applying a nullcline analysis to the equation set, it is possible to clearly demonstrate the reasons for the anomalous behavior. In summary, the degenerate solution acts as a stable fixed point under certain conditions, causing the numerical method to converge there. The analysis also suggests a methodology for preventing the anomalous behavior in steady-state computations.
Author
K-Epsilon Turbulence Model; Steady State; Turbulent Flow; Anomalies; Flow Distribution; Reynolds Averaging; Eddy Viscosity; Mathematical Models; Shear Flow

20080014496 Naval Postgraduate School, Monterey, CA USA
A Model for Minimizing Numeric Function Generator Complexity and Delay
Knudstrup, Timothy A>; Dec 1, 2007; 236 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475958; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475958

Numeric Function Generators (NFGs) allow computation of difficult mathematical functions in less time and with less hardware than commonly employed methods. They compute piecewise linear (or quadratic) approximations that represent the value of the specified function for a given input value. The domain of the function is divided into enough segments so that the approximation is within the required error to the exact value. NFG hardware complexity and delay depend on the number of segments required, the arithmetic devices used to approximate the function, and the number of bits used to represent the numbers being calculated. This thesis develops an accurate method to quantify hardware complexity and delay for various NFG configurations implemented on a Field-Programmable Gate Arrays (FPGAs). The algorithms and estimation techniques apply to various NFG architectures and mathematical functions. This thesis compares hardware utilization and propagation delay for various NFG architectures, mathematical functions, word widths, and segmentation methods. It shows that quadratic NFGs perform better than linear NFGs when the precision is above a threshold. It also shows that the majority of the functions in our benchmark have lower complexity when uniform segmentation is implemented. A criterion for choosing a segmentation method is shown for specific cases.
DTIC
Approximation; Arithmetic; Computation; Function Generators

20080014511 Naval Postgraduate School, Monterey, CA USA
Multiscale Modeling of Flows Containing Particles
Airowaijeh, Jamal S; Dec 1, 2007; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475992; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475992

Multiscale mathematical modeling of flows containing particles is conducted in this study using computational fluid

dynamics and molecular dynamics. The first study considered continuous media interaction of macro-scale fluid and micro-scale solid particles using computational fluid dynamics and rigid particle dynamics. This study investigates the potential enhancement of heat transfer properties of particulate fluid as well as the effect of injected particles on fluid profiles, and pressure on walls under different particle injection conditions. In the second part of this research, the molecular dynamics simulation was performed to simulate solid-liquid interaction at the molecular level (nanotechnology) to understand their behaviors. The results from two different scales were compared qualitatively.
DTIC
Computational Fluid Dynamics; Molecular Dynamics

20080014538 Purdue Univ., West Lafayette, IN USA
Ultra High Pressure Air Properties and CFD Code
Merkle, Charles L; Feb 28, 2007; 25 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0089
Report No.(s): AD-A476052; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476052

The research objectives are to develop effective procedures for computing fluid flow at ultra high pressures where fluids exhibit very different thermodynamic behavior than the perfect gas and incompressible fluid models that are commonly used in CFD simulations. Three issues to be addressed include: developing RANS algorithms for arbitrary fluid applications; developing efficient properties evaluation procedures for arbitrary fluids; and extending hybrid RANS-LES algorithms to high pressures. All three of these issues have been demonstrated.
DTIC
Computational Fluid Dynamics; Fluid Flow; High Pressure

20080014687 Brown Univ., Providence, RI USA
Splitting for Rare Event Simulation: A Large Deviations Approach to Design and Analysis
Dean, Thomas; Dupuis, aul; Jan 2007; 35 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0289; DMS-0306070
Report No.(s): AD-A476248; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Particle splitting methods are considered for the estimation of rare events. The probability of interest is that a Markov process first enters a set B before another set A, and it is assumed that this probability satisfies a large deviation scaling. A notion of subsolution is defined for the related calculus of variations problem, and two main results are proved under mild conditions. The first is that the number of particles generated by the algorithm grows subexponentially if and only if a certain scalar multiple of the importance function is a subsolution. The second is that, under the same condition, the variance of the algorithm is characterized 'asymptotically' in terms of the subsolution. The design of asymptotically optimal schemes is discussed, and numerical examples are presented.
DTIC
Algorithms; Design Analysis

20080014697 Pittsburgh Univ., Pittsburgh, PA USA
Algorithm Development for a Real-Time Military Noise Monitor
Vipperman, Jeffrey S; Bucci, Brian; Mar 24, 2006; 38 pp.; In English
Contract(s)/Grant(s): Proj-SI-1436
Report No.(s): AD-A476301; SI-1436; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long-range goal of this 1-year SERDP Exploratory Development (SEED) project was to create an improved real-time, high-energy military impulse noise monitoring system that can detect events with peak levels (Lpk) as low as 100 dB with a high degree of accuracy and post the results in readily usable format. Toward this goal, this phase of the project was concerned with field data collection of noise measurements to support algorithm development, processing of the signals with software to extract standard signal metrics, development of new metrics that would improve classification accuracy, and the development, training and evaluation of an artificial neural network (ANN) that used the signal metrics to determine whether a particular noise source was military impulse noise or not. Current noise monitors suffer from inaccuracies since they look for a particular shape in the noise waveform, which can be highly variable. It is reported that detection of signals with Lpk below 115 dB is difficult or impossible and that false positives (as high as 10%) can occur (primarily from wind triggers) [SERDP, 2003]. Data collection trips were conducted to the US Marine Corps Base Camp Lejeune (MCBCL), NC (military

and wind noise sources), Fort Indiantown Gap (FTIG), PA (military and wind noise sources), central Ohio (wind noise source) and suburban Pittsburgh (wind noise source). These data collection trips yielded approximately 1,000 usable waveforms (330 military impulse and 670 non-impulse events). A custom data collection system was assembled from various pieces of hardware and software to permit the collection of intermittent (impulse) or continuous (wind) sampling of signals.
DTIC
Algorithms; Neural Nets; Real Time Operation

20080015608 Army Aviation and Missile Research Develoment Engineering Center, Redstone, AL USA
An Initial Foray into the Productive Application of Computational Fluid Dynamics
Vaughn, Jr, Milton E; Auman, Lamar M; Jan 2008; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476173; TR-AMR-SS-08-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A suite of Government-developed, productivity-oriented, Computational Fluid Dynamics software has been constructed for use in the aerodynamic design of missiles. This suite is based on a robust Eulerian solver, and it uses automated grid generation to drastically reduce the time required to set up flowfield computations. The software is described and then applied to two potential hypervelocity missile configurations: one using a bent nose for aerodynamic control and the other using traditional canards. Comparisons mad with wind tunnel data demonstrate the ability of the software suite to produce meaningful results for use by aerodynamic designers.
DTIC
Aerodynamics; Computational Fluid Dynamics; Software Development Tools

20080015646 NASA Marshall Space Flight Center, Huntsville, AL, USA
3D RMHD Simulations of Magnetized Spine-sheath Relativistic Jets
Mizuno, Yosuke; Hardee, Phillip; Ken-Ichi, Nishikawa; January 28, 2008; 1 pp.; In English; Magnetic Fields in the Universe II, 28 Jan. - 1 Feb. 2008, Cozumel, Mexico; Copyright; Avail.: Other Sources; Abstract Only

We have performed numerical simulations of weakly and strongly magnetized relativistic jets embedded in a weakly and strongly magnetized stationary or mildly relativistic'(0.5c) sheath flow using the RAISHIN code. In the numerical simulations a jet with Lorentz factor gamma=2.5 is processed to break the initial equilibrium configuration. Results of the numerical simulations are compared to theoretical predictions from a normal mode analysis of the linearized RMHD equations describing a uniform axially magnetized cylindrical relativistic jet embedded in a uniform axially magnetized sheath flow. The prediction of increased stability of a weakly-magnetized system with mildly relativistic sheath flow to Kelvin-Helmholtz instabilities and the stabilization of a strongly-magnetized system with mildly relativistic sheath flow is confirmed by the numerical simulations.
Author
Magnetohydrodynamics; Kelvin-Helmholtz Instability; Uniform Flow; Embedding; Direct Numerical Simulation

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080014296 NASA Langley Research Center, Hampton, VA, USA
Classes of Split-Plot Response Surface Designs for Equivalent Estimation
Parker, Peter A.; Kowalski, Scott M.; Vining, G. Geoffrey; Quality and Reliability Engineering International; [2006]; Volume 22, No. 3, pp. 291-305; In English
Contract(s)/Grant(s): 23-090-21-TE; Copyright; Avail.: CASI: A03, Hardcopy

When planning an experimental investigation, we are frequently faced with factors that are difficult or time consuming to manipulate, thereby making complete randomization impractical. A split-plot structure differentiates between the experimental units associated with these hard-to-change factors and others that are relatively easy-to-change and provides an efficient strategy that integrates the restrictions imposed by the experimental apparatus. Several industrial and scientific examples are presented to illustrate design considerations encountered in the restricted randomization context. In this paper, we propose classes of split-plot response designs that provide an intuitive and natural extension from the completely randomized context. For these designs, the ordinary least squares estimates of the model are equivalent to the generalized least squares estimates. This property provides best linear unbiased estimators and simplifies model estimation. The design conditions that allow for equivalent estimation are presented enabling design construction strategies to transform completely

randomized Box-Behnken, equiradial, and small composite designs into a split-plot structure.
Author
Statistical Analysis; Error Analysis; Factorial Design; Estimates; Variance (Statistics); Variability

20080014444 Naval Postgraduate School, Monterey, CA USA
Determining a Cost-Effective Mix of UAV-USV-Manned Platforms to Achieve a Desired Level of Surveillance in a Congested Strait
Kim, Chuan Chng; Dec 2007; 165 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475836; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475836

This thesis develops concepts of operations (CONOPS) and analytical models to determine the surveillance assets for a congested strait. Two maritime security threats (Reds) are a hijacked large ship carrying dangerous cargo or a SB manned by terrorists attempting to cause damage to other vessels or the port. The Red SB can either conduct either a direct attack or a sneak attack by hiding among other neutral SBs. The defense force consists of shore-based sensors, un unmanned aerial vehicles manned (UAVs), unmanned surface vehicles (USVs), and patrol craft (PC). The shore-based radar and the UAVs classify unidentified vessels as suspicious or not suspicious and suspicious SB must be inspected by a USV or PC. Analytical models are introduced to analyze requirements for numbers of surveillance assets and to assess the effectiveness of the CONOPS to achieve a desired probability of detecting and intercepting the threat. They incorporate both differential equations and probabilistic arguments. Results indicate that if the UAVs generate many false positives then the USVs and PCs have a higher workload which decreases the probability of detect detecting a threat. USVs and PCs should give a high priority to inspecting suspicious SBs rather than identifying unsuspicious SBs to achieve a higher probability of detecting a threat.
DTIC
Cost Effectiveness; Mathematical Models; Protection; Security; Stochastic Processes; Straits; Surveillance

20080014446 Air Force Research Lab., Edwards AFB, CA USA
Numerical and Experimental Investigation of Microchannel Flows with Rough Surfaces (Postprint)
Lilly, T C; Duncan, J A; Nothnagel, S L; Gimelshein, S F; Gimelshein, N E; Ketsdever, A D; Wysong, I J; Oct 2007; 10 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A475842; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475842

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 150um 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: (1) polished smooth surfaces, (2) regular triangular roughness, and (3) regular square roughness with characteristic roughness scales of <1um, 11um, and 29um respectively. 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; Microchannels; Numerical Analysis; Surface Roughness

20080014501 Naval Postgraduate School, Monterey, CA USA
An Investigation of the Quantification of the Probability of Occurrence of Software Engineering Project Risks with Bayesian Probability
Klabon, Matthew L; Dec 2007; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475966; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475966

This work undertakes an analysis of the methods used in the field of software engineering to measure the probability of occurrence of identified software engineering project risks. The purpose of this work is to investigate the viability of the

exclusive use of quantitative values to measure the probability of occurrence of identified project risks within the field of software engineering rather than the qualitative values used in some probability of occurrence scales. More specifically, the goal of this analysis is to investigate the viability of achieving more precise and less subjective quantitative measurements of the probability of occurrence of identified software engineering project risks with Bayesian probability.
DTIC
Bayes Theorem; Computer Programming; Probability Theory; Risk; Software Engineering

20080014555 Library of Congress, Washington, DC USA
Iraq: Summary of U.S. Casualties
O'Bryant, JoAnne; Jul 12, 2007; 2 pp.; In English
Report No.(s): AD-A476100; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476100

The following casualty data were compiled by the Department of Defense (DoD), as tallied from the agency's press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003, plus statistics on those wounded, but not killed, since March 19, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. More frequent updates are available at DoD's website at [http://www.defenselink.mil/news/] under 'OIF/OEF Casualty Update.' A detailed casualty summary that includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD website: [http://siadapp.dmdc.osd.mil/personnel/CASUALTY/castop.htm].
DTIC
Casualties; Injuries

20080014657 Library of Congress, Washington, DC USA
Iraq: Summary of U.S. Casualties
Richardson, Glenda; Sep 23, 2003; 2 pp.; In English
Report No.(s): AD-A476128; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The following casualty table was compiled by the Department of Defense (DoD), as tallied from DoD press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. This report will be updated semiweekly, but more frequent updates are available at DoD's Web site at [http://www.defenselink.mil/news/]. Click on 'OIF Casualty Update.' A detailed casualty summary which includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD Web site: [http://web1.whs.osd.mil/mmid/casualty/OIF-Total.pdf].
DTIC
Casualties; Death

20080014658 Library of Congress, Washington, DC USA
Iraq: Summary of U.S. Casualties
Fischer, Hannah; May 19, 2005; 2 pp.; In English
Report No.(s): AD-A476129; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The following casualty table was compiled by the Department of Defense (DoD), as tallied from DoD press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003, plus statistics on those wounded, but not killed, since March 19, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. This report will be updated semiweekly, but more frequent updates are available at DoD's website at [http://www.defenselink.mil/news/]; click on 'OIF/OEF Casualty Update.' A detailed casualty summary that includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD website: [http://web1.whs.osd.mil/mmid/casualty/OIF-Total.pdf].
DTIC
Casualties; Injuries

20080014659 Library of Congress, Washington, DC USA
Iraq: Summary of U.S. Casualties
Richardson, Glenda; Oct 14, 2003; 2 pp.; In English
Report No.(s): AD-A476130; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The following casualty table was compiled by the Department of Defense (DoD), as tallied from DoD press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. This report will be updated semiweekly, but more frequent updates are available at DoD's Web site at [http://www.defenselink.mil/news/]. Click on 'OIF Casualty Update.' A detailed casualty summary which includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD Web site: [http://web1.whs.osd.mil/mmid/casualty/OIF-Total.pdf].
DTIC
Casualties; Death

20080014660 Library of Congress, Washington, DC USA
Iraq: Summary of U.S. Casualties
Richardson, Glenda; Oct 2, 2003; 2 pp.; In English
Report No.(s): AD-A476131; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The following casualty table was compiled by the Department of Defense (DoD), as tallied from DoD press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. This report will be updated semiweekly, but more frequent updates are available at DoD's Web site at [http://www.defenselink.mil/news/]. Click on 'OIF Casualty Update.' A detailed casualty summary which includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD Web site: [http://web1.whs.osd.mil/mmid/casualty/OIF-Total.pdf].
DTIC
Casualties; Death

20080014661 Library of Congress, Washington, DC USA
Iraq: Summary of U.S. Casualties
Fischer, Hannah; Apr 4, 2005; 2 pp.; In English
Report No.(s): AD-A476132; CRS-RS21578; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The following casualty table was compiled by the Department of Defense (DoD), as tallied from DoD press releases. Table 1 provides statistics on fatalities during Operation Iraqi Freedom, which began on March 19, 2003, and is ongoing, as well as on the number of fatalities since May 1, 2003, plus statistics on those wounded, but not killed, since March 19, 2003. Statistics may be revised as circumstances are investigated and as all records are processed through the U.S. military's casualty system. This report will be updated semiweekly, but more frequent updates are available at DoD's website at [http://www.defenselink.mil/news/]; click on 'OIF/OEF Casualty Update.' A detailed casualty summary that includes data on deaths by cause, as well as statistics on soldiers wounded in action, is available at the following DoD website: [http://web1.whs.osd.mil/mmid/casualty/OIF-Total.pdf].
DTIC
Casualties; Injuries

20080014676 Brown Univ., Providence, RI USA
Large Deviations for Infinite Dimensional Stochastic Dynamical Systems
Budhiraja, Amarjit; Dupuis, Paul; Maroulas, Vasileios; Mar 27, 2007; 29 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0230; W911NF-05-1-0289
Report No.(s): AD-A476186; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The large deviations analysis of solutions to stochastic differential equations and related processes is often based on approximation. The construction and justification of the approximations can be onerous, especially in the case where the process state is infinite dimensional. In this paper we show how such approximations can be avoided for a variety of infinite dimensional models driven by some form of Brownian noise. The approach is based on a variational representation for functionals of Brownian motion. Proofs of large deviations properties are reduced to demonstrating basic qualitative properties

'existence, uniqueness, and tightness' of certain perturbations of the original process.
DTIC
Dynamical Systems; Stochastic Processes

20080014723 Naval Surface Warfare Center, Dahlgren, VA USA
Computation of the Circular Error Probable (CEP) and Confidence Intervals in Bombing Tests
DiDonato, Armido; Nov 2007; 39 pp.; In English
Report No.(s): AD-A476368; NSWCDD/TR-07/13; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this report is to assess the performance of a radar bomb director (RBD) by computing its CEP (Circular Error Probable) on the basis of measurements of miss distances in actual bomb drops falling under an uncorrelated bivariate normal distribution. in addition, confidence intervals (CIs) for the CEP are established. On the basis of these results and the assignment of a nominal CEP, one can also decide whether or not the statistical accuracy requirements of the RBD have been met, or whether further testing is required. An available Fortran 95 computer program is described, which for a given set of bomb drops, generates an estimated CEP and three different CIs: a conventional interval, a minimum one, and when possible, a symmetric one. The acceptance or nonacceptance of the RBD's performance, or whether more testing is needed, is also an optional part of the output.
DTIC
Error Analysis; Probability Theory

20080015417 North Carolina Univ., Chapel Hill, NC USA
Large Deviations for Stochastic Flows of Diffeomorphisms
Budhiraja, Amarjit; Dupuis, Paul; Maroulas, Vasileios; Jan 2007; 26 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0230
Report No.(s): AD-A476150; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A large deviation principle is established for a general class of stochastic flows in the small noise limit. This result is then applied to a Bayesian formulation of an image matching problem, and an approximate maximum likelihood property is shown for the solution of an optimization problem involving the large deviations rate function.
DTIC
Stochastic Processes; Bayes Theorem; Maximum Likelihood Estimates

20080015571 European Research Office (US Army), London, UK
Estimating the Sediment Yield Due to Bend Migration in Meandering Rivers
Thorne, Colin; Sikder, Salam; Sep 30, 2007; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-06-P-0316; 1108-EN-01
Report No.(s): AD-A476212; RK1525-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Management of sediment in rivers is a major element of the sustainable use of natural watercourses. In the USA this is addressed through Regional Sediment Management (RSM). To be effective, RSM needs data on sediment inputs to the fluvial system, including that from bank erosion, which may account for as much as 75% of the load. In this research, a database of 1,512 meander bends on rivers in the USA was used to supply information on bend migration rates over 20- to 60-year periods. Statistical analysis was performed on the bend migration data to explore the relationship between the bend planform at the beginning of each monitoring period (represented by R/w = the ratio of bend radius to channel width) and the average rate of bend migration (represented by E/w = the ratio of the average annual retreat of the outer bank to the channel width). A probability analysis was used to derive a series of curves for E/w as a function of R/w for probabilities of the expected rate of erosion not being equaled or exceeded ranging from 10% to 99%. This analysis provides the basis for predicting the rate of bank erosion due to bend migration with a user-selected probability of the rate not being equaled or exceeded. Prediction of the volume of bank sediment input to the watercourse due to bend migration also requires estimation of the average height of the eroding bank and the length of channel along which erosion occurs. The eroding bank height may be estimated using an algorithm developed in previous research performed for the USACE for average scour depth at the outer margins of meander bends (Thorne et al. 1995). The length of eroding bank may be estimated from field observation or using expert judgment based on consideration of the Brice data set (Soar and Thorne 1999). Methods to make these estimates are presented to enable users to predict the volume of sediment derived from bank erosion due to bend migration in single-thread, alluvial, meandering rivers.
DTIC
Bending; Erosion; Estimates; Estimating; Migration; Rivers; Sediments

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080014320 NASA Langley Research Center, Hampton, VA, USA

Dual Mission Scenarios for the Human Lunar Campaign - Performance, Cost and Risk Benefits

Saucillo, Rudolph J.; Reeves, David M.; Chrone, Jonathan D.; Stromgren, Chel; Reeves, John D.; North, David D.; March 08, 2008; 36 pp.; In English; 2008 IEEE Aerospace Conference, 1-8 Mar. 2008, Big Sky, MT, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 329231.03.01.04

Report No.(s): IEEEAC Paper 1183, Version 7; Copyright; Avail.: CASI: A03, Hardcopy

Scenarios for human lunar operations with capabilities significantly beyond Constellation Program baseline missions are potentially feasible based on the concept of dual, sequential missions utilizing a common crew and a single Ares I/CEV (Crew Exploration Vehicle). For example, scenarios possible within the scope of baseline technology planning include outpost-based sortie missions and dual sortie missions. Top level cost benefits of these dual sortie scenarios may be estimated by comparison to the Constellation Program reference two-mission-per-year lunar campaign. The primary cost benefit is the accomplishment of Mission B with a 'single launch solution' since no Ares I launch is required. Cumulative risk to the crew is lowered since crew exposure to launch risks and Earth return risks are reduced versus comparable Constellation Program reference two-mission-per-year scenarios. Payload-to-the-lunar-surface capability is substantially increased in the Mission B sortie as a result of additional propellant available for Lunar Lander #2 descent. This additional propellant is a result of EDS #2 transferring a smaller stack through trans-lunar injection and using remaining propellant to perform a portion of the lunar orbit insertion (LOI) maneuver. This paper describes these dual mission concepts, including cost, risk and performance benefits per lunar sortie site, and provides an initial feasibility assessment.

Author

Lunar Exploration; Moon; Mission Planning; Cost Analysis; Risk; Technological Forecasting; Feasibility Analysis; Operations Research

20080014387 Military Academy, West Point, NY USA

Annual Faculty Research Report of the Department of Systems Engineering and the Operations Research Center for the Academic Year 2007

Goerger, Simon R; Trainor, Timothy E; Finnegan, Patrick; Jan 2008; 122 pp.; In English

Report No.(s): AD-A475440; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475440

The purpose of this document is to formally summarize and conclude the research program of the U.S. Military Academy Department of Systems Engineering (DSE) and the Operations Research Center for Excellence (ORCEN) for the Academic Year 2007. The annual research report includes a statement of purpose for research which supports DSE and the ORCEN, a description of the two organizations, a list of the key personnel responsible for executing the plan, and an overview of the annual research cycle.

DTIC

Operations Research; Systems Engineering; United States

20080014414 Naval Postgraduate School, Monterey, CA USA

Systems Analysis and Modeling of U.S. Navy Submarine Repair Operational Target (OPTAR) Processes

Trujillo, Lynn A; Dec 2007; 91 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475765; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475765

This work performed a systems level analysis of Submarine repair budgeting and spending in an effort to articulate the unique behaviors of this combined system of budgeting, supply chain management, and spending control. Current Navy policies, procedures, and budget forecast methods were studied to develop the basic causal relationships of the budgeting and spending behavior in order to develop a basic model of the system. The effects of feedback and delays inherent in the system structure were analyzed to determine overall system amplification and oscillation potential in spending behavior is possible given various changes to inputs. Observations over spending data recorded from 1996 to 2006 for the submarine force are

analyzed against the knowledge of the system dynamics to determine if this real behavior can be successfully reconstructed in the model.
DTIC
Navy; Submarines; Systems Analysis; Targets

20080014432 Naval Postgraduate School, Monterey, CA USA
An Adaptive Security Construct: Insurgency in Sudan
Colloton, Patrick T; Maitre, Benjamin R; Stoner, Tommy E; Dec 2007; 191 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475805; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475805

Internal wars are by default the business of others, until someone says they are not. Artificially contained within the confines of the current international system, insurgent conflicts are considered domestic affairs only until they threaten external interests. In judging intrastate conflict by and large from a crisis-response perspective, conventional assessment methodologies, oriented largely toward interstate wars, tend to fall short in objectively analyzing the historical and dynamic aspects of internal wars. This thesis develops an Adaptive Security Construct (ASC) that aims to correct such shortcomings through the multi-disciplinary integration of three conceptual lenses: a qualitative situation estimate, a game-theoretic dynamic conflict model, and geospatially oriented nexus topography. Using Sudan's internal wars as a case study, where the existence of signed peace-agreements in both the south and Darfur exist in apparent contradiction of these conflicts' causes, the ASC iteratively correlates the analysis of each of the three lenses to provide an observer a more objective external view of conflicts that are inherently 'internal.' This thesis presents the ASC as an iterative process and perspective that enables the formulation of general imperatives and specific approaches in response to contemporary arenas of conflict, both in Sudan and within the international community at large.
DTIC
Game Theory; Security; Sudan; Topography

20080014441 Naval Postgraduate School, Monterey, CA USA
How Terrorism Works: Terrorism as a Disequalizing Input to the Social System
Damato, James P; Dec 2007; 141 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475823; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475823

This thesis uses social system equilibrium theory to answer the question how terrorism works. Counterterrorism policy can benefit from a systems analysis of both terrorist groups and targeted social systems. Current terrorism theory does not adequately address the broad question of how terrorism causes political-social change and is thus of limited use to counter strategic terrorist objectives. This thesis proposes the Dynamic Equilibrium Theory of Terrorism (DETT) as a social systems framework for understanding how terrorism causes change. The social system is examined as a complex living system composed of two primary components: value and environment. These two components exist in dynamic equilibrium, a homeostatic process of balance which functions to keep the system operating within normal parameters. When these components are out of balance, changes occur within the system. If the value-environment relationship is significantly out of balance, the system may enter disequilibrium, characterized by dysfunction and a high likelihood of violence. Terrorism is a unique political weapon because it targets a social system's equilibrium in order to force change. It is a violent environmental input at immediate and recognizable odds with a system's value and as such disrupts the value-environment equilibrium. The DETT theory offered in this thesis is used to examine Al Qaeda and the attacks of 9/11. Theses attacks were a terrorist input that disrupted our social system equilibrium and forced changes.
DTIC
Sociology; Systems Analysis; Terrorism

20080014519 Naval Postgraduate School, Monterey, CA USA
U.S. Army Tactical Wheeled Vehicles Modernization Strategy: An Optimization Model
Seng, Roy Goh-Choo; Dec 2007; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476013; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476013

This thesis addresses the issue of optimal budget allocation in the modernization of the U.S. Army's Light Tactical

Wheeled Vehicles (LTWV). To achieve the objective for this research, a decision optimization tool was requested by the U.S. Tank-Automotive and Armaments Life Cycle Management Command (TACOM LCMC) and Program Executive Office, Combat Support / Combat Service Support (PEO CS/CSS) to provide an analytical tool to serve as the underpinning for modernization strategies for the LTWV over the next fifteen fiscal years. The optimization tool was implemented in Excel, using Excel Premium Solver Platform as the solver engine. An initial analysis was done to demonstrate the validity of the model, using notional data and the weighted values from the Value Model. Sensitivity analyses were also performed on the model by varying the inputs, such as the budgetary and average age requirements, to look at the capabilities that can be provided during the modernization period.
DTIC
Mathematical Models; Optimization

20080014534 Brown Univ., Providence, RI USA
High-Order Accurate Time-Domain Electromagnetics and RCS Prediction for Dynamic and Uncertain Scatters
Hesthaven, Jan S; Sep 30, 2007; 24 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0072
Report No.(s): AD-A476047; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476047

In this project we have pursued the development of computational ways of quantifying the impact of uncertainties on RCS computation. We present a systematic, accurate, and efficient way of addressing such problem, essentially enabling one to compute with an ensample of data and, subsequently, obtain a full space-time ensample of solutions with an associated probability density. The uncertainties can be present in the sources, the materia1s, or the geometries.
DTIC
Electromagnetic Fields; Electromagnetism

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THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080014533 Air Force Research Lab., Wright-Patterson AFB, OH USA
A High-Order Compact Finite-Difference Scheme for Large-Eddy Simulation of Active Flow Control
Rizzetta, Donald P; Visbal, Miguel R; Morgan, Philip E; Jan 2008; 105 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A04Y
Report No.(s): AD-A476045; AFRL-RB-WP-TR-2008-3033; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476045

A computational approach for performing large-eddy simulation (LES) of flows with active control is summarized. Simulation of these problems typically characterized by small-scale fluid structures cannot be carried out accurately by methods less sophisticated than LES. The numerical scheme is predicated upon an implicit time-marching algorithm, and utilizes a high order compact finite-difference approximation to represent spatial derivatives. Robustness of the scheme is maintained by employing a low-pass Pade-type non-dispersive spatial filter, which also serves as an implicit sub-grid turbulent model. Geometrically complex applications are accommodated by a high order overset grid technique. Utility of the method is illustrated by steady and pulsed approaches to suppression of acoustic resonance in supersonic cavity flow, leading-edge vortex control of a delta wing, efficiency enhancement of a transitional highly loaded low-pressure turbine blade, and separation control of a wall-mounted hump model. Where available, comparisons are also made with experimental data.
DTIC
Active Control; Eddy Currents; Finite Difference Theory; Flow Distribution; Large Eddy Simulation; Simulation

20080015372 Naval Undersea Warfare Center, Newport, RI USA
Search Path Evaluation Incorporating Object Placement Structure
Baylog, John G; Wettergren, Thomas A; Dec 20, 2007; 70 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475921; NUWC-NPT-TR-11-845; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475921

This report describes a computationally robust approach to search path performance evaluation where the objects of

search interest exhibit structure in the way in which they occur within the search space. The report describes the undenying theoretical probability basis for the search evaluation computations, and provides specific details about the implementation of the numerical method. While the method is general for searchers looking for objects with structured placement, specific examples are given that are drawn from a mine hunting application. In these examples, the object structures to be examined are the laying of mines. In specific mine field patterns, and the performance criterion under evaluation is search effectiveness and its relation to object clearance. Numerical issues such as the discretization of space, the detail of representation, and the scalability of computation are discussed. The application of this theoretical foundation and the numerical methods to other search paradigms is also discussed.
DTIC
Spatial Distribution; Probability Theory; Numerical Analysis; Performance Tests

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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*.

20080014392 Princeton Univ., NJ USA
Finite Heisenberg-Weyl Groups and Golay Complementary Sequences
Howard, S D; Calderbank, A R; Moran, W; Jan 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-12-1-0802
Report No.(s): AD-A475667; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475667

We provide a new way of understanding Golay pairs 'of length N' of sequences in terms of the '2N + 1'-dimensional discrete Heisenberg-Weyl group over the field Z2. Our methodology provides a different insight into the nature of these sequences, as well as a mechanism for designing sequences with desirable correlation properties. Libraries of waveforms formed using these constructions are able to provide collections of ambiguity functions that cover the range-Doppler plane in an efficient way, and thus provide the basis for a suite of waveforms optimized for extraction of information from the environment in an active sensing context.
DTIC
Doppler Effect; Sequencing; Waveforms

20080014429 ATK Launch Systems, Brigham City, UT USA
Mechanical Properties for an Arbitrary Arrangement of Rigid Spherical Particles Embedded in an Elastic Matrix (Preprint)
Hatch, Robert L; Davis, I L; Dec 13, 2006; 69 pp.; In English
Contract(s)/Grant(s): F04611-98-C-0005; Proj-1011
Report No.(s): AD-A475800; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475800

A computer code has been written which calculates the small deformation stress and strain fields of a medium consisting of a pack of rigid spherical particles embedded in an elastic Hookean matrix. The stress and strain tensors can be calculated at any point in the medium to within a user-specified accuracy. Average mechanical properties of the medium are also output by the code. The code has been used to simulate systems consisting of thousands of particles in a finite pack. Optionally, the code treats an infinite pack made up of repeating 3D rectangular cells of a particle pack. The multipole expansion technique used to solve the equations of small deformation for the elastic medium consists of truncated sums of complete orthogonal vector spherical harmonics. Techniques are presented which improve the convergence of the solution when the particles are in close proximity for highly filled materials. The code has been tested against exact solutions of configurations consisting of a few particles as well as infinite packs of particles in body-centered cubic, face-centered cubic, and simple cubic lattice arrangements. The code has been used to estimate mechanical properties of a variety of monomodal and bimodal particle packs of different packing densities for a matrix material with a variety of elastic constants.
DTIC
Embedding; Mechanical Properties

20080014430 Tech-X Corp., Boulder, CO USA

Dependence of Electron Peak Current on Hollow Cathode Dimensions and Seed Electron Energy in a Pseudospark Discharge (Preprint)

Cetiner, S O; Stoltz, P; Messmer, P; Cambier, Jean-Luc; Jun 3, 2007; 25 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-2511; Proj-OSDB

Report No.(s): AD-A475801; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475801

The pre-breakdown and breakdown phases of a pseudospark discharge are investigated using the two-dimensional kinetic plasma simulation code OOPIC Pro. Trends in the peak electron current at the anode are presented as function of the hollow cathode dimensions and mean seed injection velocities at the cavity back wall. The plasma generation process by ionizing collisions is examined, showing the effect on supplying the electrons that determine the density of the beam. The mean seed velocities used here are varied between the velocity corresponding to the energy of peak ionization cross-section, fifteen times this value and no mean velocity (i.e. electrons injected with a temperature of 2.5 eV). The reliance of the discharge characteristics on the penetrating electric field is shown to decrease as the mean seed injection velocity increases because of its ability to generate a surplus plasma independent of the virtual anode. As a result, the peak current increases with the hollow cathode dimensions for the largest average injection velocity, while for the smallest value it increases with the area of penetration of the electric field in the hollow cathode interior. Additionally, for a given geometry an increase in the peak current with the surplus plasma generated is observed. Although the present study uses Argon only, the variation in the discharge dependencies with the seed injection energy relative to the ionization threshold is expected to apply independently of the gas type. Secondary electrons due to electron and ion impact are shown to be important only for the largest impact areas and discharge development times of the study.

DTIC

Cathodes; Electric Current; Electric Discharges; Electron Energy; Hollow Cathodes; Seeds

20080014455 Naval Postgraduate School, Monterey, CA USA

A Position Tracking System Using MARG Sensors

Um, Miryung; Dec 2007; 77 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475853; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475853

The objective of this thesis was to further the development of a personal position tracking system using MARG sensors. This work advanced the method by which distance and heading were calculated of an individual wearing one MARG sensor on his/her foot when moving about under normal walking conditions. Data was collected from the foot-mounted sensor while walking a straight-line path, a square path, and climbing stairs. The corresponding data from these activities was then used in a Matlab program to determine a computed position. The Matlab program employed a technique that reset the accelerometer error during the stance phase of the gait cycle. It also utilized a gait detection algorithm based on the magnitude of angular rate and the number of samples above/below threshold to establish the periods of the stance phase and the swing phase. Experimental results from various testing scenarios showed that it is feasible to track position of a person.

DTIC

Biodynamics; Kinematics; Walking

20080014484 Lehigh Univ., Bethlehem, PA USA

Vierendeel Type Steel Truss/Composite Skin Hybrid Ship Hulls

Grenestedt, Joachim L; Oct 1, 2007; 6 pp.; In English

Contract(s)/Grant(s): N00014-03-1-0597

Report No.(s): AD-A475927; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475927

The project dealt with mechanical issues related to hybrid ship hulls made with composite panels attached to a steel truss. The steel truss was designed to carry the bending loads of the hull girder, whereas the composite skins were designed to carry shear and water pressure loads. Experimental and numerical evaluations of the concept were performed. A six meter (20 ft) model, which had been built and initially tested in 2004 under a separate grant, was turned upside-down and tested to verify performance under hogging loads. After these hogging tests, the model was turned back and tested to failure after simulated internal blast by removal of select panels. Material tests and elastic-plastic analyses were performed. Four journal papers

describing the work on the present hybrid ship hull concept have been submitted for publication (three have been published and the last one has been accepted).
DTIC
Sandwich Structures; Ship Hulls; Steels; Trusses

20080014716 NAVSYS Corp., Colorado Springs, CO USA
High-Gain Advanced GPS Receiver for Precision GPS Applications
Brown, Alison; Silva, Randy; Powers, Ed; May 2000; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476342; No Copyright; Avail.: Defense Technical Information Center (DTIC)

NAVSYS has developed a GPS receiver, the HAGR (High-gain Advanced GPS Receiver), which uses digital beam steering to increase the precision of the GPS observations. In this paper, the HAGR is described and test data is included showing its enhanced performance for high accuracy scientific applications. When operating in a differential or kinematic positioning mode, HAGR provides low noise observations of the pseudo-range and carrier-phase data. By coherently combining signals from as many as 16 antenna elements, the gain to each satellite tracked can be increased by over 10 dB. Moreover, the digital beam steering approach used also acts to reduce the errors contributed by multipath effects. Test data is presented on the HAGR measurement accuracy for high accuracy scientific applications. In this paper, the GPS carrier-phase time transfer technique is described and a discussion is included on the error components that currently limit the time-transfer accuracy using this method. Sub-nanosecond time transfer capabilities are expected using GPS carrier-phase observations. Testing to date has shown that conventional GPS receivers introduce significant time offsets in the carrier phase. These offsets are on the order of 1-2 nanoseconds and currently dominate the error budget when performing carrier-phase time transfer. Test data is also presented from the HAGR showing the accuracy of the code and carrier phase observations for time transfer applications.
DTIC
Global Positioning System; High Gain; Receivers

20080014718 CSA Engineering, Inc., Mountain View, CA USA
Durability Patch: Repair and Life Extension of High Cycle Fatigue Damage on Secondary Structure of Aging Aircraft
Rogers, Lynn C; Maly, Joseph R; Searle, Ian R; Ikegami, Roy; Owen, Wes; Gordon, Robert W; Conley, David; Jul 1997; 32 pp.; In English
Report No.(s): AD-A476346; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Durability Patch Program addresses the repair and life enhancement of nuisance cracks which have been induced into secondary structure by resonant high cycle fatigue from aerovibroacoustics. For this type of damage, safety of flight concerns are virtually non-existant, but maintenance and repair costs are high. Conventional repair techniques consist of mechanically fastened, single sided doublers. For significant static in-plane loads and/or for significant vibration levels due to out-of-plane dynamic loads, the repair does not last long because new cracks will form and emanate from the repair. Eventually, large areas of skin and substructure will have to be replaced. The Durability Patch consists of a bonded pair region which is an elastic elliptical laminate overlaid by and surrounded by a thoroughly integrated damping treatment. In some configurations the transition from the elastic repair region to the damping region is accomplished by the use of a viscoelastic material instead of a structural adhesive in one layer; thus, the other layers are multi-functional. The bonded repair does not introduce stress concentrations, does reduce static and dynamic stresses, and does reduce crack tip stress intensities. Damping is maximized within thickness and area constraints in order to enhance the life of adjoining structure with undetected damage. The life improvement goal is 600x. Finite element analysis results comparing static and vibratory stresses will be presented. High cycle fatigue and crack growth rates will be compared. The design and use of a miniature autonomous damage dosimeter to obtain service temperature and vibration environmental data at low cost will be described. Selection of structural materials and processes to attain a goal of field installation will be described. Comparison of analysis and laboratory results will be presented. Patch configurations will be described and compared using a numerical measure of merit system.
DTIC
Crack Propagation; Durability; Fatigue (Materials); Life (Durability)

20080014725 National Chung Hsing Univ., Taichung, Taiwan, Province of China
Hybrid Semiconductor Nanostructures as Unique Capabilities in the Direct Detection of Proteins, Viruses, and DNA
Lin, Kuan-Jiuh; Kuo, Watson; Tsai, Ching-Hsiu; Feb 6, 2008; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA48690610094
Report No.(s): AD-A476381; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nano approach to fighting cancer is exploding. Devices based on field-effect transistors (FETs) are one of emerging fields

for sensing technology. Several other research terms have made similar progress in electrically detecting cancer specific markers using new types of nanodevices. Lieber and colleagues doped charge-carrying silicon nanowires with monoclonal antibodies specific for the cancer proteins. When the proteins linked up with the antibodies, the electrical charges of the proteins changed the conductance of the silicon wires. This change signaled the presence and concentration of cancer markers. Hence, the electrical signal transduction plays an important role on EFTs devices for the direct detection of biological and chemical species. In addition to silicon nanowires, today nanostructured semiconducting oxides, such as SnO2, ZnO2, and V2O5, have attracted extensive interest because of their distinctive electronic and/or optical properties. In particular, individual nanowires or nanotubes have been fabricated recently on field-effect transistor devices that provide a very promising technology for chemical and biological sensors. However, the electrical signal transduction for semiconductor oxides in general take place at high temperature (above at 200 degree C), at which temperature environment will damage biomolecules. We proposed an entirely new ideal to synthesize organic-inorganic hybrid synergistic semiconductors. We suggested that the redox organic radical molecules may be trapped into the crystalline oxide to become a new hybrid-semiconductor that is thought to enrich electronic transport through the surface of the oxides.
DTIC

Biochemistry; Deoxyribonucleic Acid; Electrical Resistivity; Nanostructures (Devices); Oxidation-Reduction Reactions; Proteins; Semiconductors (Materials); Viruses

20080015391 Defence Science and Technology Organisation, Victoria, Australia

A Crack Growth Rate Conversion Module: Theory, Development, User Guide and Examples

Tong, Yu C; Hu, Weiping; Mongru, David; Sep 2007; 62 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475761; DSTO-TR-2050; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475761

The use of crack growth analysis tools based on plasticity-induced crack closure model, such as FASTRAN, CGAP and AFGROW, requires the conversion of crack growth rate versus the nominal stress intensity range curves to a ‘single’ curve of crack growth rate versus the effective stress intensity range. In order to minimise the error arising from crack growth rate conversion and judicially utilise these software tools, a user-friendly tool was integrated into CGAP. This report documents the theory, implementation, the user guide and examples of the crack growth rate conversion software module.
DTIC

Crack Propagation; Fatigue (Materials); Stress Intensity Factors; Errors

20080015578 Wright Brothers Inst., Inc., Dayton, OH USA

RFID Preventive Maintenance and Troubleshooting (Preprint)

Sengupta, Arijit; Sethi, Vikram; Oct 2007; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8650-06-3-9021; Proj-2865

Report No.(s): AD-A476291; No Copyright; Avail.: Defense Technical Information Center (DTIC)

RFID installations consist of a large number of interdependent and interconnected components that function together as a unit for proper functionality and operations of the system. These components include tags, readers, antennas, networks, computing systems, power supplies, and peripherals, accessories and other mechanical systems that are controlled by the RFID implementation. Current RFID hardware is still relatively delicate and no two implementations are exactly the same. Even after an RFID system is has been successfully installed, there is a possibility that it will face various performance-related issues, including reader failure, tag failure, or problems with the middleware. In order to track, predict, and prevent performance problems, the system will need to be closely monitored. This report concentrates on two primary areas to be monitored: (i) monitoring of basic system status, and (ii) monitoring the overall system behavior.
DTIC

Maintenance; Preventive Maintenance; Radio Frequencies

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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*.

20080014261 NASA Langley Research Center, Hampton, VA, USA
A Nonlinear Reduced Order Method for Prediction of Acoustic Fatigue
Przekop, Adam; Rizzi, Stephen A.; Computers and Structures; [2006]; Volume 84, Nos. 24-25, pp. 1606-1618; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-794-40-4A; Copyright; Avail.: CASI: A04, Hardcopy

The goal of this investigation is to assess the quality of high-cycle-fatigue life estimation via a reduced order method, for structures undergoing geometrically nonlinear random vibrations. Modal reduction is performed with several different suites of basis functions. After numerically solving the reduced order system equations of motion, the physical displacement time history is obtained by an inverse transformation and stresses are recovered. Stress ranges obtained through the rainflow counting procedure are used in a linear damage accumulation method to yield fatigue estimates. Fatigue life estimates obtained using various basis functions in the reduced order method are compared with those obtained from numerical simulation in physical degrees-of-freedom.
Author
Acoustic Fatigue; Fatigue Life; Nonlinearity; Life (Durability); Dynamic Structural Analysis; Mathematical Models; Direct Numerical Simulation

20080014264 NASA Langley Research Center, Hampton, VA, USA
Investigation of Acoustical Shielding by a Wedge-Shaped Airframe
Gerhold, Carl H.; Clark, Lorenzo R.; Dunn, Mark H.; Tweed, John; Journal of Sound and Vibration; [2006]; Volume 294, Nos. 1-2, pp. 49-63; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-706-81-00-52; Copyright; Avail.: CASI: A03, Hardcopy

Experiments on a scale model of an advanced unconventional subsonic transport concept, the Blended Wing Body (BWB), have demonstrated significant shielding of inlet-radiated noise. A computational model of the shielding mechanism has been developed using a combination of boundary integral equation method (BIEM) and equivalent source method (ESM). The computation models the incident sound from a point source in a nacelle and determines the scattered sound field. In this way the sound fields with and without the airfoil can be estimated for comparison to experiment. An experimental test bed using a simplified wedge-shape airfoil and a broadband point noise source in a simulated nacelle has been developed for the purposes of verifying the analytical model and also to study the effect of engine nacelle placement on shielding. The experimental study is conducted in the Anechoic Noise Research Facility at NASA Langley Research Center. The analytic and experimental results are compared at 6300 and 8000 Hz. These frequencies correspond to approximately 150 Hz on the full scale aircraft. Comparison between the experimental and analytic results is quite good, not only for the noise scattering by the airframe, but also for the total sound pressure in the far field. Many of the details of the sound field that the analytic model predicts are seen or indicated in the experiment, within the spatial resolution limitations of the experiment. Changing nacelle location produces comparable changes in noise shielding contours evaluated analytically and experimentally. Future work in the project will be enhancement of the analytic model to extend the analysis to higher frequencies corresponding to the blade passage frequency of the high bypass ratio ducted fan engines that are expected to power the BWB.
Author
Airframes; Blended-Wing-Body Configurations; Aircraft Noise; Shielding; Aircraft Engines; Acoustic Scattering

20080014269 NASA Langley Research Center, Hampton, VA, USA
Free-field Calibration of the Pressure Sensitivity of Microphones at Frequencies up to 80 kHz
Herring, G. C.; Zuckerwar, Allan J.; Elbing, Brian R.; Journal of the Acoustical Society of America; [2006]; Volume 119, No. 1, pp. 320-329; In English
Contract(s)/Grant(s): 23-781-10-11; Copyright; Avail.: CASI: A03, Hardcopy

A free-field (FF) substitution method for calibrating the pressure sensitivity of microphones at frequencies up to 80 kHz is demonstrated with both grazing and normal incidence geometries. The substitution-based method, as opposed to a simultaneous method, avoids problems associated with the non-uniformity of the sound field and, as applied here, uses a 1/2 -inch air-condenser pressure microphone as a known reference. Best results were obtained with a centrifugal fan, which is used as a random, broadband sound source. A broadband source minimizes reflection-related interferences that often plague FF

measurements. Calibrations were performed on 1/4-inch FF air-condenser, electret, and micro-electromechanical systems (MEMS) microphones in an anechoic chamber. The accuracy of this FF method is estimated by comparing the pressure sensitivity of an air-condenser microphone, as derived from the FF measurement, with that of an electrostatic actuator calibration and is typically 0.3 dB (95% confidence), over the range 2-80 kHz.
Author
Microphones; Sensitivity; Calibrating; Sound Fields; Microelectromechanical Systems; Sound Pressure; Acoustic Frequencies

20080014339 NASA Langley Research Center, Hampton, VA, USA
Experimental Feedback Control of Flow Induced Cavity Tones
Cabell, Randolph H.; Kegerise, Michael A.; Cox, David E.; Gibbs, Gary P.; January 2005; 21 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 23-762-55-MT; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014339

Discrete-time, linear quadratic methods were used to design feedback controllers for reducing tones generated by flow over a cavity. The dynamics of a synthetic jet actuator mounted at the leading edge of the cavity as observed by two microphones in the cavity were modeled over a broad frequency range using state space models computed from experimental data. Variations in closed loop performance as a function of model order, control order, control bandwidth, and state estimator design were studied using a cavity in the Probe Calibration Tunnel at NASA Langley. The controller successfully reduced the levels of multiple cavity tones at the tested flow speeds of Mach 0.275, 0.35, and 0.45. In some cases, the closed loop results were limited by excitation of sidebands of the cavity tones, or the creation of new tones at frequencies away from the cavity tones. Nonetheless, the results validate the combination of optimal control and experimentally-generated state space models, and suggest this approach may be useful for other flow control problems. The models were not able to account for non-linear dynamics, such as interactions between tones at different frequencies.
Author
Feedback Control; Jet Flow; Aeroacoustics; Cavity Flow; Pitch; Frequency Ranges; Linear Quadratic Gaussian Control; Discrete Functions; Piezoelectric Actuators

20080014498 Naval Postgraduate School, Monterey, CA USA
Non Linear Internal Waves: Modeling of Their Influence on Acoustic Mode Energy Fluctuations and Characterization Using SAR Systems
Simon, Alban; Dec 2007; 111 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475961; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475961

Non Linear Internal Waves (NLIW) are ubiquitous and appear wherever a proper combination of stratified water, current and bathymetry occur. In recent years, they have also been proven of primary interest for acoustic oceanography, since they are known to play an important role in sound speed fluctuations in shallow waters. The predictability of acoustic variability caused by these waves has been somewhat limited, and largely based on direct numerical simulation. Through this project, we present a simple and computationally efficient analytic model based on coupled mode theory. For this purpose, narrow and broadband acoustic normal mode fluctuations in the 2001 South China Sea ASIAEX experiment are first examined. Then ASIAEX environmental data were used to characterize the space/time scales of NLIW sound speed structure. Finally, a comparison is conducted between the observed normal mode variability and the predictions from an analytic model utilizing the observed NLIW structure, such as its width, amplitude and speed. As the model proves to be very sensitive to these characteristics, an overview of the Synthetic Aperture Radar capabilities to retrieve them is also conducted. In this latter part of the project, particular attention is given to wind effects on SAR data.
DTIC
Acoustic Emission; Characterization; Internal Waves; Nonlinearity; Sound Waves; Synthetic Aperture Radar; Underwater Acoustics

20080014706 California Univ., Davis, CA USA
Development of Bioacoustic Tools for Long-Term,Non-invasive Monitoring of Threatened and Endangered Birds
McCowan, Brenda; Bowles, Ann; Jul 14, 2006; 64 pp.; In English
Contract(s)/Grant(s): W912HQ-05-P-0016; Proj-SI-1392
Report No.(s): AD-A476322; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The project's objective was to develop quantitative bioacoustic techniques that can be used to monitor population

densities and trends as well as assess the effects of military training and other anthropogenic activities on the population dynamics of threatened and endangered birds, and specifically the Mexican spotted owl.
DTIC
Acoustics; Bioacoustics; Birds; Communication; Sound Transmission

20080015378 NASA Johnson Space Center, Houston, TX, USA
Fan Acoustic Issues in the NASA Space Flight Experience
Allen, Christopher S.; Goodman, Jerry; April 02, 2008; 40 pp.; In English; NASA Quiet, Efficient Fans for Space Flight Workshop, 2-3 Apr. 2008, Moffett Field, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015378

Emphasis needs to be placed on choosing quiet fans compatible with systems design and specifications that control spec levels: a) Sound power; b) Choose quiet fan or plan to quiet it, early in program; c) Plan early verification that fan source allocations are met. Airborne noise: a) System design should function/play together with fans used (flow passages, restrictions, bends, expansions & contractions, and acoustics) vs. fan speed understood (nominal, worst case, & unplanned variances); b) Fan inlets treated, as required; c) Fan Outlets treated, as required; d) Ducted system inlets are outlets designed for acoustic compliance compatibility & designed so some late required modifications can be made without significant impacts. Structure Borne Noise: a) Structure borne noise dealt with as part of fan package or installation; b) Duct attachments and lines isolated. Case Radiated Noise: - Treatment added as much as possible to fan package (see example).
Derived from text
Systems Engineering; Design Analysis; Acoustics; Ducts; Fans; Noise

20080015520 Naval Research Lab., Washington, DC, USA; Naval Research Lab., Washington, DC, USA; Naval Research Lab., Washington, DC, USA; NASA Langley Research Center, Hampton, VA, USA
Volumetric Acoustic Vector Intensity Probe
Klos, Jacob; [2006]; 12 pp.; In English; Original contains color and black and white illustrations
Report No.(s): AIP/123-QED; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015520

A new measurement tool capable of imaging the acoustic intensity vector throughout a large volume is discussed. This tool consists of an array of fifty microphones that form a spherical surface of radius 0.2m. A simultaneous measurement of the pressure field across all the microphones provides time-domain near-field holograms. Near-field acoustical holography is used to convert the measured pressure into a volumetric vector intensity field as a function of frequency on a grid of points ranging from the center of the spherical surface to a radius of 0.4m. The volumetric intensity is displayed on three-dimensional plots that are used to locate noise sources outside the volume. There is no restriction on the type of noise source that can be studied. The sphere is mobile and can be moved from location to location to hunt for unidentified noise sources. An experiment inside a Boeing 757 aircraft in flight successfully tested the ability of the array to locate low-noise-excited sources on the fuselage. Reference transducers located on suspected noise source locations can also be used to increase the ability of this device to separate and identify multiple noise sources at a given frequency by using the theory of partial field decomposition. The frequency range of operation is 0 to 1400Hz. This device is ideal for the study of noise sources in commercial and military transportation vehicles in air, on land and underwater.
Author
Pressure Measurement; Noise Generators; Acoustic Measurement; Frequency Ranges; Low Noise; Near Fields; Acoustical Holography

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*.

20080014299 NASA Langley Research Center, Hampton, VA, USA
Air-Broadening of H2O as a Function of Temperature: 696 - 2163 cm(exp -1)
Toth, R. A.; Brown, L. R.; Smith, M. A. H.; Devi, V. Malathy; Benner, D. Chris; Dulick, M.; Journal of Quantitative Spectroscopy and Radiative Transfer; [2006]; Volume 101, pp. 339-366; In English
Contract(s)/Grant(s): 2351-291-07-70; Copyright; Avail.: CASI: A03, Hardcopy

The temperature dependence of air-broadened halfwidths are reported for some 500 transitions in the (000)-(000) and

(010)-(000) bands of H2(16)O using gas sample temperatures ranging from 241 to 388 K. These observations were obtained from infrared laboratory spectra recorded at 0.006 to 0.011 cm(exp-1) resolution with the McMath-Pierce Fourier transform spectrometer located at Kitt Peak. The experimental values of the temperature dependence exponents, eta, were grouped into eight subsets and fitted to empirical functions in a semi-global procedure. Overall, the values of eta were found to decrease with increasing rotational quantum number J. The number of measurements (over 2200) and transitions (586) involved exceeds by a large margin that of any other comparable reported study.
Author
Temperature Dependence; Water; Pressure Broadening; Water Vapor; Fourier Transformation; Gas Temperature

20080014337 NASA Langley Research Center, Hampton, VA, USA
Molecular-dynamics Simulation-based Cohesive Zone Representation of Intergranular Fracture Processes in Aluminum
Yamakov, Vesselin I.; Saether, Erik; Phillips, Dawn R.; Glaessgen, Edward H.; Journal of the Mechanics and Physics of Solids; [2006]; Volume 54, No. 9, pp. 1899-1928; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS1-00135; NCC-1-02043; 23-064-20-32; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014337

A traction-displacement relationship that may be embedded into a cohesive zone model for microscale problems of intergranular fracture is extracted from atomistic molecular-dynamics simulations. A molecular-dynamics model for crack propagation under steady-state conditions is developed to analyze intergranular fracture along a flat 99 [1 1 0] symmetric tilt grain boundary in aluminum. Under hydrostatic tensile load, the simulation reveals asymmetric crack propagation in the two opposite directions along the grain boundary. In one direction, the crack propagates in a brittle manner by cleavage with very little or no dislocation emission, and in the other direction, the propagation is ductile through the mechanism of deformation twinning. This behavior is consistent with the Rice criterion for cleavage vs. dislocation blunting transition at the crack tip. The preference for twinning to dislocation slip is in agreement with the predictions of the Tadmor and Hai criterion. A comparison with finite element calculations shows that while the stress field around the brittle crack tip follows the expected elastic solution for the given boundary conditions of the model, the stress field around the twinning crack tip has a strong plastic contribution. Through the definition of a Cohesive-Zone-Volume-Element an atomistic analog to a continuum cohesive zone model element - the results from the molecular-dynamics simulation are recast to obtain an average continuum traction-displacement relationship to represent cohesive zone interaction along a characteristic length of the grain boundary interface for the cases of ductile and brittle decohesion. Keywords: Crack-tip plasticity; Cohesive zone model; Grain boundary decohesion; Intergranular fracture; Molecular-dynamics simulation
Author
Molecular Dynamics; Continuum Modeling; Crack Propagation; Grain Boundaries; Plastic Properties; Fracturing; Stress Distribution; Traction

20080014654 Kyoto Univ., Japan
Spectroscopic Characterization of Microplasmas
Tachibana, Kunihide; Jan 28, 2008; 14 pp.; In English
Contract(s)/Grant(s): FA4869-06-1-0103
Report No.(s): AD-A476119; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have developed a new type of microplasma integrated device with a fabric structure of insulator-coated thin metal wires. It has been proved that the device can be operated at relatively low voltage of a few kV in air and even under water with the help of hydrogen bubbles produced by electrolysis of water. We have performed spectroscopic measurements for characterizing the properties of microplasmas in a single jet and in an assembly of two-dimensional array for estimating the electron density as well as the reactive species compositions. Although it is clear that more comprehensive research should be continued to grasp the whole image of microplasmas for deriving general scaling laws, we have clarified those high potentiality for the applications to material processing tools and microwave controlling devices.
DTIC
Microplasmas; Plasmas (Physics); Spectroscopy

20080014670 Suranaree Univ.of Technology, Nakhon Ratchasima, Thailand
Theoretical Study of Defect Signatures in III-V and II-VI Semiconductors
Limpijumnong, Sukit; Mar 2006; 62 pp.; In English
Contract(s)/Grant(s): FA5209-05-P-0309
Report No.(s): AD-A476175; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The study of defects in III-V and ZnO semiconductors was accomplished using ultrasoft pseudopotential (USPP) method. For that, a numerical approach was also implemented to calculate isotropic hyperfine-parameters for isolated defects based on a supercell method.
DTIC
Defects; Infrared Signatures; Isotropy; Pseudopotentials; Semiconductors (Materials); Signatures; Zinc Oxides

20080015580 Universal Energy Systems, Inc., Dayton, OH USA
Advanced TEM Sample Preparation Using Low Energy (Preprint)
Scheltens, F J; Wheeler, IV , R; Mahalingam, K; Nov 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-03-C-5206; Proj-4347
Report No.(s): AD-A476321; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The recent advent and availability of aberration-corrected (S)TEM instruments means that more information about samples are visible, and important aspects of their chemistry, atom locations, surface properties, and microstructure are quantifiable in both 2D and 3D. Surface damage and unintended ion implanted layers incurred during ion beam-assisted TEM sample preparation are being more deeply recognized as artifacts limiting the information that can be obtained using analytical electron microscopy. Both the quality and quantity of scientific and technological results are impacted by artifacts because deleterious surface layers are often a significant fraction of total sample thickness, and also because more samples of more materials are being made by ion beam-assisted techniques. After initially being prepared using conventional broad-beam or focused ion-beam assisted milling, samples that have been post-processed with low voltage Ar ion beams show significant reductions in surface amorphous layer thickness, and also alteration of implanted Ga layers.
DTIC
Electron Energy; Electron Microscopy; Energy Dissipation; Spectroscopy

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*.

20080014408 Naval Postgraduate School, Monterey, CA USA
Time Dependent Behavior of Light Emitting Polymers for Potential Individual Identify Friend or Foe (IIFF) Applications
Schumacher, Johannah G; Dec 2007; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475744; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475744

Light Emitting Polymers (LEPs) are being developed for lightweight, low cost, infrared emitters for potential Individual IFF applications. The unique requirements for emitter operation (modulated, short term response) require study of time dependent optical and electrical behavior. Multiple LEP devices were evaluated to determine intensity variations and voltage response as a function of time and activations. From experimental data, it became possible to suggest approaches for creating the optimum LEP device for future IIFF devices. Key results included the increase of intensity in all emitters, observation of necessary warm-up periods for yellow devices, large voltage responses of red emitters, and device reset time. All emitters saw intensity increase while being activated continuously over short periods of time. The yellow emitter had the largest intensity variation, so a warm-up period of constant current was used, significantly impacting the intensity. The red devices were determined to have large turn-on voltages at initial activation. The device reset time, or the time for the intensity to drop after reaching optimum intensity was also determined. Further research into the combination of red and yellow dyes is suggested, as well as continued research into the impact that small periods of operating time have on LEP intensity.
DTIC
Emitters; IFF Systems (Identification); Light (Visible Radiation); Time Dependence

20080014439 Naval Postgraduate School, Monterey, CA USA

Phase Diversity Wavefront Sensing for Control of Space Based Adaptive Optics Systems

Schgallis, Richard J; Dec 2007; 71 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475819; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475819

Phase Diversity Wavefront Sensing (PD WFS) is a wavefront reconstruction technique used in adaptive optics, which takes advantage of the curvature conjugating analog physical properties of a deformable mirror (MMDM or Bi-morph) such that the computational intensity required for correcting an aberrated wavefront, becomes simplified over traditional Shack-Hartmann WFS techniques. By looking at an image reflected off a deformable mirror by two cameras placed on either side of focus of a lens, intensity differences, indicating wavefront aberration in the beam, can be detected by the cameras acting together as a WFS and analyzed by a computer providing control to the actuators of a deformable mirror such that any detected difference in intensities between the two cameras can be minimized. This process of mirror surface conjugation serves to correct for the aberrated or curved wavefront by reflecting a new wavefront, compensated for curvature, such that its reflection is approximately planar. The theory of PD WFS is well documented however, there is very little quantifiable information regarding the specific challenges in designing a functioning PD WFS. In this research a PD WFS was designed and the concept proven such that a wavefront could be corrected through a computer controlled closed loop conjugation of a deformable mirror. The results were analyzed using a traditional Shack-Hartmann WFS and off-the-shelf Front Surfer wavefront analysis software to verify the validity of the experimental data. PD WFS has become critical in the development of segmented mirror adaptive optical systems where traditional wavefront reconstruction using Shack-Hartmann wavefront sensing tends to break down at the mirror segment edges. The Naval Postgraduate School, Spacecraft Research and Design Center (SRDC) intends to explore the use of a segmented mirror adaptive optical systems for space based applications.

DTIC

Adaptive Optics; Detection; Wave Fronts

20080014450 Naval Postgraduate School, Monterey, CA USA

Wavefront Control for Space Telescope Applications Using Adaptive Optics

Allen, Matthew R; Dec 1, 2007; 109 pp.; In English; Original contains color illustrations

Report No.(s): AD-A475847; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA475847

Future long dwell high resolution imagery satellites and space telescopes will require very large flexible primary mirrors. These large mirrors face many challenges including optical surface imperfections, structural vibrations, and jitter. A flexible mirror can overcome some of these challenges by applying adaptive optics techniques to correct mirror deformations and aberrations to produce image quality data. This paper examines and develops control techniques to control a deformable mirror subjected to a disturbance. The experimental portion of the work uses discrete time proportional integral control with second order filters to control disturbances in a deformable mirror and correct aberrations in an adaptive optics system using laser light. Using an adaptive optics testbed containing two deformable mirrors, two fast steering mirrors, two wave front sensors, a position sensor, and a combination of lenses the system corrects a simulated dynamic disturbance induced in the deformable mirror. Experiments using the described testbed successfully demonstrate wavefront control methods, including a combined iterative feedback and gradient control technique. This control technique results in a three fold improvement in RMS wavefront error over the individual controllers correcting from a biased mirror position. Second order discrete time notch filters are also used to remove induced low frequency actuator and sensor noise at 0.8 Hz, 2 Hz and 5 Hz. Additionally a 2 Hz structural disturbance is simulated on a Micromachined Membrane Deformable Mirror and removed using discrete time notch filters combined with a modal iterative closed loop feedback controller, showing a 36 fold improvement in RMS wavefront error over the iterative closed loop feedback alone.

DTIC

Adaptive Optics; Deformable Mirrors; Spaceborne Telescopes; Telescopes; Wave Fronts

20080015401 Air Force Research Lab., Wright-Patterson AFB, OH USA

High-Order Methods For Wave Propagation

Visbal, Miguel R; Sherer, Scott E; White, Michael D; Jan 2008; 72 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-A04Y

Report No.(s): AD-A476109; AFRL-RB-WP-TR-2008-3032; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476109

In order to meet the demanding accuracy requirements in the simulation of wave propagation phenomena, a numerical

approach based on high-resolution spatial schemes is presented. The time-domain AFRL code, FDL3DI, solves either the time-dependent Maxwell's equations (for CEM) or the Euler equations (for acoustics) employing 6th-order accurate compact-differences and low-pass spatial filters of up to 10th-order accuracy. The solver has been made applicable to general curvilinear grids through the incorporation of a careful treatment of the coordinate transformation metrics. In addition, the method has been extended to multi-body scattering applications through the use of overset grids and high-order interpolation. A robust absorbing boundary condition exploiting the transfer function of the low-pass filter has been developed. To evaluate the solver, several benchmark problems have been considered. Application to communication through weakly ionized plasma has also been studied.
DTIC
Wave Propagation; Accuracy; Spatial Filtering; High Resolution; Numerical Analysis

20080015437 Hampton Univ., VA, USA; NASA Langley Research Center, Hampton, VA, USA
Optical Characterization of Metallic Aerosols
Sun, Wenbo; Lin, Bing; [2005]; 25 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Airborne metallic particulates from industry and urban sources are highly conducting aerosols. The characterization of these pollutant particles is important for environment monitoring and protection. Because these metallic particulates are highly reflective, their effect on local weather or regional radiation budget may also need to be studied. In this work, light scattering characteristics of these metallic aerosols are studied using exact solutions on perfectly conducting spherical and cylindrical particles. It is found that for perfectly conducting spheres and cylinders, when scattering angle is larger than approx. 90 deg. the linear polarization degree of the scattered light is very close to zero. This light scattering characteristics of perfectly conducting particles is significantly different from that of other aerosols. When these perfectly conducting particles are immersed in an absorbing medium, this light scattering characteristics does not show significant change. Therefore, measuring the linear polarization of scattered lights at backward scattering angles can detect and distinguish metallic particulates from other aerosols. This result provides a great potential of metallic aerosol detection and monitoring for environmental protection.
Author
Aerosols; Light Scattering; Metals; Particulates; Optics; Airborne Radar

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20080014530 Air Force Research Lab., Wright-Patterson AFB, OH USA
High-Speed Magnetohydrodynamic Flow Control Analyses With 3-D Simulations
Gaitonde, Datta; Jan 2008; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A038
Report No.(s): AD-A476039; AFRL-RB-WP-TR-2008-3018; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476039

Magnetohydrodynamic studies of high-speed flow control are described with emphasis on understanding fluid response to specific plasma-based perturbations. Detailed analysis is presented of the effect of magnitudes and gradients of magnetic and electric fields, their orientation relative to the velocity vector, ionized region location and extent, and various nondimensional parameters. The balance between ponderomotive force and heating is a major determinant of the effectiveness through competition between work and ohmic dissipation, while viscous/inviscid interactions play a crucial role by distorting the velocity field. The interaction with an external circuit through electrodes is relatively efficient when fluid is slowed and energy is extracted, but yields high boundary layer heating and loss of control performance when fluid is accelerated. These observations are employed to unify results focused on a broad range of objectives including heat transfer reduction, 3-D separation suppression through momentum transfer, inviscid instability growth rate modulation and energy management in multiple simulated tip-to-tail scramjet designs
DTIC
High Speed; Magnetohydrodynamic Flow; Magnetohydrodynamics; Nonequilibrium Flow; Propulsion; Simulation; Thermochemistry

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*.

20080014272 NASA Langley Research Center, Hampton, VA, USA
Quantitative Assessment of Fatigue Damage Accumulation in Wavy Slip Metals from Acoustic Harmonic Generation
Cantrell, John H.; Philosophical Magazine; [2006]; Volume 86, No. 11, pp. 1539-1554; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-079-80-SL; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014272

A comprehensive, analytical treatment is presented of the microelastic-plastic nonlinearities resulting from the interaction of a stress perturbation with dislocation substructures (veins and persistent slip bands) and cracks that evolve during high-cycle fatigue of wavy slip metals. The nonlinear interaction is quantified by a material (acoustic) nonlinearity parameter beta extracted from acoustic harmonic generation measurements. The contribution to beta from the substructures is obtained from the analysis of Cantrell [Cantrell, J. H., 2004, Proc. R. Soc. London A, 460, 757]. The contribution to beta from cracks is obtained by applying the Paris law for crack propagation to the Nazarov-Sutin crack nonlinearity equation [Nazarov, V. E., and Sutin, A. M., 1997, J. Acoust. Soc. Am. 102, 3349]. The nonlinearity parameter resulting from the two contributions is predicted to increase monotonically by hundreds of percent during fatigue from the virgin state to fracture. The increase in beta during the first 80-90 percent of fatigue life is dominated by the evolution of dislocation substructures, while the last 10-20 percent is dominated by crack growth. The model is applied to the fatigue of aluminium alloy 2024-T4 in stress-controlled loading at 276MPa for which experimental data are reported. The agreement between theory and experiment is excellent.
Author
Damage Assessment; Metal Fatigue; Cracks; Fracturing; Substructures; Harmonic Generations; Acoustic Measurement

20080015575 Universal Energy Systems, Inc., Dayton, OH USA
Estimating the Strength of Single-Ended Dislocation Sources in Micron-Sized Single Crystals (Postprint)
Rao, S I; Dimiduk, D M; Tang, M; Parthasarathy, T A; Uchic, M D; Woodward, C; Oct 2007; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8650-04-D-5233; Proj-2311
Report No.(s): AD-A476258; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Three-dimensional (3D) discrete dislocation dynamics simulations were used to calculate the effects of anisotropy of dislocation line tension (increasing Poisson's volumes with free surfaces) and to compare them with the strength of double-ended sources of equal length. Their plastic response was directly modeled within a 1um3 volume composed of a single crystal fcc metal. In general, double-ended sources are stronger than single-ended sources of an equal length and exhibit no significant effects from truncating the long-range elastic fields at this scale. The double-ended source strength increases with v, exhibiting an increase of about 50% at v=0.38 (value of Ni) as compared to the value at v=0. Independent of dislocation line direction, for v greater than 0.20, the strengths of single-ended sources depended upon the sense of the stress applied.
DTIC
Estimating; Single Crystals

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*.

20080014355 NASA, Washington, DC, USA
The Power of Story
Cohen, Don; Fox, Jessica; Ask Magazine; Winter 2008, pp. 27-28; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014355

A major knowledge-sharing issue that is the source of many project problems: how to communicate our intentions so that

the information received is the same as the information given. One answer is conversation-the back-and-forth of statement, question, and response that gradually brings talkers and listeners to a shared understanding. Stories also offer a way to share knowledge effectively. While the story teller's intent and the listener's interpretation will not be identical, a good story reliably communicates essential knowledge so it is not only understood but absorbed and embraced. Narrative is one of the oldest knowledge-transfer systems in the world. Religion knows it. Politicians know it. Fairytales know it. Now, knowledge management practitioners are coming to know it, too. But why are stories such a powerful knowledge-transfer tool? And what kinds of knowledge do they transfer? Joseph Campbell, the mythologist, defined stories as serving four major functions: the mystical, the cosmological, the sociological, and the pedagogical. The mystical function of narrative lies in its ability to open up emotional realization that often connects with a transcendent idea such as love or forgiveness. He calls this realization 'mystical' because it connects the self with the universal. What Campbell calls the cosmological function of stories relates the self to the outside world, focusing on action, on understanding cause and effect and our role in it. For the cosmological function of stories 'to be up to date and really to work in the minds of people who are living in the modern scientific world,' Campbell notes, 'it must incorporate the modern scientific world.' We must continually tell stories that demonstrate our current vision of the world. The sociological function of stories, Campbell explains, helps maintain and validate the social order of a society. Stories pass on information about power relationships, taboos, laws, and the inner workings of communities. Countries and religions have stories that serve this function and so do organizations and project teams, where stories about project work communicate information about behaviors and attitudes that are expected and rewarded or frowned upon and penalized. Functioning pedagogically, says Campbell, narratives guide individuals harmoniously through the stages of life in terms of their world today, with its current goods, values, and dangers. These are stories that deal with life transitions and guide us from one stage to another. Stories powerfully serve these functions partly because of two great strengths: their ability to engage listeners personally and emotionally and their use of metaphor. And it turns out that these two things are related.
Derived from text
Cosmology; Conversation; Project Management; Laws; Organizations

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080014344 NASA, Washington, DC, USA
The Project Manager Who Saved His Country
Baniszewski, John; Ask Magazine; Winter 2008, pp. 42-45; In English; See also 20080014343; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014344

George Meade defeated Robert E. Lee, one of the greatest military leaders of all time. How did he do it? By using the skills he had learned as a project manager and outperforming Lee in all aspects of project management. Most project managers are familiar with the Project Management Institute's 'Guide to the Project Management Body of Knowledge' (PMBOK), which identifies the skills and knowledge crucial to successful project management. Project managers need to make sure that all the elements of a project work together. They must develop and execute plans and coordinate changes to those plans. A project manager must define the scope of the work, break it into manageable pieces, verify and control what work is being done, and make sure that the work being done is essential to the project. Every project manager knows the challenges of schedule and the value of schedule slack. Project managers must get the resources they need and use them effectively. Project managers get the people they need and use their talents to achieve mission success. Projects generate huge amounts of information. A key to project success is getting sufficient and accurate information to the people who need it when they need it. Project managers must identify and quantify the risks that jeopardize project success and make plans for dealing with them. Studying Meade and Lee's performances at Gettysburg can help modern project managers appreciate, develop, and use the skills they need to be good project managers. The circumstances may be different, but the basic principles are the same. This dramatic event in American history shows how the skills of project management can be used in almost any situation. Former project manager George Meade used those skills to change the tide of the Civil War.
Derived from text
Project Management; Schedules; Risk

20080014347 NASA, Washington, DC, USA

Reaching for the APEX at Ames

Kohut, Matthew; Ask Magazine; Winter 2008, pp. 40-41; In English; See also 20080014343; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014347

The multidimensional design of the APEX program is the result of an extensive research and development effort dating back nearly a decade. 'In the late 1990s and early 2000, we were pretty successful at getting new research and technology projects here at the center,' Johnson says, 'and we had a lack of critical mass of project managers. We were taking people who were primarily researchers and putting them in the position of managing projects.' Smith and Johnson held a series of workshops across the center during 2000 and 2001 to gather feedback about how to address this issue. When they briefed the center's senior management on their findings, one of the top recommendations was to establish a project manager development program at Ames. At that point, they cast a wide net for ideas and information. 'We did centerwide needs assessment, we did focus groups, we did surveys,' Smith says. 'We came up with a proposal for what a program would look like, tying in what we knew about the Academy of Program1 Project Leadership (now the Academy for Program/Project and Engineering Leadership, or APPEL), what we've seen at other centers, what other centers have tried. We were always checking to make sure our program mapped to APPEL. We also looked at the PMI [Project Management Institute] model, INCOSE [International Council on Systems Engineering], CMMI [Capability Maturity Model Integration], you name it.' 'We had a lot of conversations with the Jet Propulsion Lab and Goddard,' Johnson adds. 'We saw those centers as models for what Ames was aspiring to be in terms of a center for managing space flight missions.' Their research confirmed what they already knew-that strong practitioner involvement would be critical to their program design process. 'XPEX is for the practitioner by the practitioner,' Smith says. 'They have to be a part of designing it. Otherwise there's no way we could design a program that meets their needs.' At the same time that they worked at the grassroots level, they also solicited feedback from the center's senior management. 'We recognized that in order for anything to succeed here, we needed to have a champion at the center management level,' Johnson said. 'You have to have champions, and you have to listen to what the senior managers are saying. They have their own ideas.' In the case of APEX, one of those ideas fundamentally reshaped the program. 'When we originally started, it was a project management development program,' Johnson says, 'but in our meeting with our center director, he said, 'Project management is important, but we also need to strengthen our systems engineering.' So we basically added that component to the program based on what he wanted.'

Derived from text

Project Management; Systems Engineering; Leadership; Feedback; Chronology; Time Measurement

20080014349 NASA Johnson Space Center, Houston, TX, USA

Leading Your Leaders

Hale, Wayne N.; Ask Magazine; Winter 2008, pp. 8-11; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080014349

Even though working on a problem has been your primary effort for the past year, your leadership may have heard about this once in a briefing a decade ago. Now they are basically clueless. Pretend that you are talking to your daughter's fifth-grade class. Explain how your complicated gizmo works. If possible, do not use acronyms. Define your terms. Put your work in context. Assume your leader has no idea what you do, who you work for, or what your gizmo does. That is a good place to start. Remember, taking the next century to study the problem or spending the Gross National Product to invent a new solution are probably not going to be acceptable solutions. Real engineers and technicians build real hardware that works in the real world in a reasonable manner within a reasonable time at a reasonable cost. True, skimping on time or money can cause mistakes, but folks whose gizmos are delayed unreasonably or cost more than is practical get their programs canceled, force the business into bankruptcy, or give the market over to the competition. Real engineers and technicians always consider cost and schedule in their work. Raising questions is important. However, we are in the business of doing things. Engineers and technicians are paid to get things done. Yes, you have to identify the problem, frame the design, identify the tests, perform the analysis, and assemble the hardware. But the goal is to solve the problem. Nobody ever said flying in space was easy. We make it look easy the same way that an Olympic champion makes her sport look easy: by working hard at improving performance every day. Better are the results of a well-defined test. Remember that a test on a laboratory bench is always an approximation of reality, and rules similar to those for good analysis also apply. One should always be mindful of Mechelay's rule: 'It is better to be stupid than to run a stupid test.' Often we try to overtest. If a piece of hardware passes an unbelievably difficult test, then life is good. More often when an unbelievably difficult test fails, we are left with a very long discussion of why and what was wrong in the design or execution of the test. Make sure that the test is well defined. Even then, it is

important to explain to your leaders what inherent accuracy (or error) the test conditions or equipment have and what the assumptions or initial conditions were for the test. Test results without a good understanding of the test's accuracy or the pedigree of the test assumptions are worth very little. Finally, there is flight test data. Always limited, never at the edge of the envelope, it still shows how the real hardware works in a combined environment. Flight experience is dangerous because it typically doesn't show how close to the edge of the cliff the equipment is operating, but it does demonstrate how the hardware really works. A flight test is the ultimate test, again taken with the knowledge that it is probably not the extreme but something more like the middle of the environmental and systems performance. Good understanding of a problem and its solution always relies on a combination of all these methods. Be sure to lead your leaders by using all the tools you have at your disposal. At the end of the day, decisions in space flight always come down to a risk trade. Our business is not remotely safe, not in the sense that the public, the media, or our legislators use the term. Everything we do has a risk, cost, schedule, or performance trade-off. For your leaders to make an appropriate decision, you need to educate them, lead them, talk with them, and engage them in the discussion until full understanding takes place. It's your job. *
Derived from text
Leadership; Accuracy; Commerce; Schedules; Risk; Flight Tests; Engineers

20080014350 NASA, Washington, DC, USA
Best Buy: Planning for Disaster
Sachs, Adam; Ellis, Kerry; Sachs, Adam; Ask Magazine; Winter 2008, pp. 17-19; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014350

When a 1981 tornado in Minnesota revolutionized the retail approach of Sound of Music, which later changed its name to the now very familiar Best Buy, those who founded the company never imagined that a series of hurricanes twenty years later would also help give it a cutting-edge lead in customer service and disaster planning. That original 'Tornado Sale'' introduced low prices in a 'no-frills' environment that gave the company higher sales than the industry average and paved the way to a new business model. But before Best Buy could find the silver lining of these new storm clouds., it needed to survive them by planning for the destructive weather that plagued Florida during the summer of 2004. Having seen the power of listening to its employees and customers, Best Buy now seeks to capture their thoughts and feedback about other elements of the business.
Derived from text
Commerce; Disasters; Personnel; Storms; Feedback; Hurricanes

20080014353 Umea Univ., Sweden
Choosing and Developing the Right Leadership Styles for Projects
Mueller, Ralf; Ask Magazine; Winter 2008, pp. 46-; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy

Analyzing extensive questionnaires completed by 400 project management professionals, Professor Rodney Turner of the Lille Graduate School of Management and I have identified competencies that contribute significantly to project management success. Our research helps define the managerial and emotional competencies needed to make projects work. We also found that different kinds of projects call for different combinations of competencies.
Derived from text
Leadership; Project Management; Sensory Feedback; Management Methods

82
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*.

20080014354 NASA, Washington, DC, USA
The Costs of Knowledge
Prusak, Laurence; Ask Magazine; Winter 2008, pp. 50-51; In English; See also 20080014343; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014354

Acquiring knowledge-genuinely learning something new-requires the consent and commitment of the person you're

trying to learn from. In contrast to information, which can usually be effectively transmitted in a document or diagram, knowledge comes from explaining, clarifying, questioning, and sometimes actually working together. Getting this kind of attention and commitment often involves some form of negotiation, since even the most generous person's time and energy are limited. Few experts sit around waiting to share their knowledge with strangers or casual acquaintances. In reasonably collaborative enterprises- I think NASA is one-this sort of negotiation isn't too onerous. People want to help each other and share what they know, so the 'cost' of acquiring knowledge is relatively low. In many organizations (and many communities and countries), however, there are considerable costs associated with this activity, and many situations in which negotiations fail. The greatest knowledge cost is in and adopting knowledge to one's own use. Sometimes this means formally organizing what one learns in writing. Sometimes it means just taking time to reflect on someone else's thoughts and experiences-thinking about knowledge that is not exactly what you need but can lead you to develop ideas that will be useful. A long, discursive conversation, with all the back-and-forth that defines conversation, can be a mechanism of knowledge exchange. I have seen many participants at NASA APPEL Masters Forums talking, reflecting, and thinking-adapting what they are hearing to their own needs. Knowledge transfer is not a simple proposition. An enormous amount of information flows through the world every day, but knowledge is local, contextual, and 'stickyn-that is, it takes real effort to move it from one place to another. There is no way around this. To really learn a subject, you have to work at it, you have to pay your 'knowledge dues.' So while, thanks to advances in technology, almost infinite amounts of information are instantly available, it still takes the same amount of time and work to learn French as it did in the year 1800-or to master physics or philosophy.
Derived from text
Information Flow; Knowledge; Information Transfer; Organizations; Costs; Conversation

20080014388 Air Command and Staff Coll., Maxwell AFB, AL USA
Using the Media in the Proper Cultural Context to Win Iraqi and US Hearts and Minds in Support of Operation Iraqi Freedom
Lampley, Kingston; Apr 2006; 36 pp.; In English
Report No.(s): AD-A475640; AU/ACSC/7228/AY06; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475640

Media sources (newspapers, magazines, television programs, radio broadcasts, etc.) are not capable on their own of winning the hearts and minds of a population. The media is simply a tool that delivers heart-changing and mind-changing ideals (such as the greatness of democracy and respect for minority rights) and information (such as the positive results of the U.S.-led occupation of Iraq). This paper presents the author's tool for analyzing the process of communication between the media and populations. When communicating, there is a messenger (the U.S. Government (USG) or U.S. military), a message or idea (the goodness of democracy or the success of Operation Iraqi Freedom (OIF)), and a receiver (the Iraqi or U.S. population). The message is delivered by a conduit (the media) and is filtered through a cultural context as it travels to the receiver. The cultural context of Iraq needs to be taken into account when using the media to advance ideals and information that will make success more likely for U.S. and coalition forces. The USG and the military must use the media to combat the poisonous ideals being communicated by insurgents in Iraq who use terrorist tactics against coalition forces and noncombatant civilians. By understanding the cultural context that the insurgents manipulate to garner support in Iraq, the USG and the military will be able to use the media to win the hearts of the Iraqi people. There are two groups of hearts and minds who the USG aims to win to affect the success of OIF: those of the Iraqi people and those of the American people. The primary role of U.S. military commanders in Iraq should be to use the media to directly win the hearts and minds of the Iraqi people. The secondary role of commanders is to provide objective information about OIF to the USG and the American people while depending on the political branches of the government to use that information to win the hearts and minds of the American people.
DTIC
Heart; Iraq; News Media; United States; Warfare

20080014396 National Oceanographic Data Center, Washington, DC USA
Report to the U.S. Congress on the National Oceanographic Partnership Program
Mar 2005; 107 pp.; In English
Report No.(s): AD-A475705; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475705

Established in FY 1997, the National Oceanographic Partnership Program (NOPP) promotes the national goals of assuring national security, advancing economic development, protecting quality of life, and strengthening science education and communication through improved knowledge of the ocean. The National Ocean Research Leadership Council (NORLC), now

comprising leaders of fifteen Federal agencies, guides NOPP in identifying and carrying out partnerships among Federal agencies, industry, and other members of the ocean sciences community in support of those goals. In the first seven years of the Program, NOPP-Funded activities focused on the following five areas: operational/routine observations, research observatories , observational technique development, a commons for ocean information, and outreach/education. In FY 2004, NOPP developed a new Ten-Year Strategic Plan. The prior investment areas were coalesced and reconfigured to address four NOPP Goals established in the Strategic Plan: Achieve and Sustain an Integrated Ocean Observing System (IOOS); Promote Lifelong Ocean Education; Modernize Ocean Infrastructure and Enhance Technology Development; and Foster Interagency Partnerships to Increase and Apply Scientific Knowledge. NOPP-Funded activities are those that are either solicited or managed by NOPP and involve support from two or more agencies. Overall investment in NOPP-funded activities, which totaled $30 million in FY 2004, has increased significantly since the program's inception. From FY 1997 to FY 2004, NOPP has funded 93 projects, including 20 renewal projects, in response to Broad Agency Announcements and Requests for Proposals. Of the total funds awarded during this period, approximately 56 percent, 26 percent and 18 percent went to academia, government and industry (including nongovernmental organizations/others), respectively.
DTIC
Oceanography; Security

20080014397 National Oceanographic Data Center, Washington, DC USA
Report to the U.S. Congress on the National Oceanographic Partnership Program
Mar 2004; 65 pp.; In English
Report No.(s): AD-A475706; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475706

Established in FY 1997, the National Oceanographic Partnership Program (NOPP) promotes the national goals of assuring national security, advancing economic development, protecting quality of life, and strengthening science education and communication through improved knowledge of the ocean. The National Ocean Research Leadership Council (NORLC), now comprising leaders of fifteen Federal agencies, guides NOPP in identifying and carrying out partnerships among Federal agencies, industry, and other members of the oceanographic scientific community in support of those goals. NOPP investments have focused on the following five areas: operational/routine observations, research observatories , observational technique development, a commons for ocean information, and outreach/education. NOPP funded activities are those that are either solicited or managed by NOPP and involve support from two or more agencies. Overall investment in NOPP funded activities, which totaled $24 million in FY 2003, has increased significantly since the program's inception. From FY 1997 to FY 2003, NOPP has funded 84 projects, including 20 renewal projects, in response to Broad Agency Announcements and Requests for Proposals. Of the total funds awarded during this period, approximately 57%, 25%, 11% and 7% went to academia, government, industry and non-governmental organizations/others, respectively. In addition to NOPP funded activities, individual agencies invest in NOPP related activities, which are funded primarily by a single agency in response to plans produced by NOPP entities. Examples include several projects related to the development of an Integrated Ocean Observing System (IOOS), which is coordinated through a NOPP interagency office called Ocean. US. Significant new investments in NOPP related activities are anticipated over the next decade.
DTIC
Economic Development; Industries; Leadership; Oceanographic Parameters; Oceanography

20080014448 National Oceanographic Data Center, Washington, DC USA
Report to the U.S. Congress on the National Oceanographic Partnership Program
Mar 2003; 60 pp.; In English
Report No.(s): AD-A475845; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475845

Established in FY 1997, the National Oceanographic Partnership Program (NOPP) promotes the national goals of assuring national security, advancing economic development, protecting quality of life, and strengthening science education and communication through improved knowledge of the ocean. The National Ocean Research Leadership Council (NORLC), now comprising leaders of fifteen Federal agencies, guides NOPP in identifying and carrying out partnerships among Federal agencies, industry, and other members of the oceanographic scientific community in support of those goals. NOPP investments have focused on the following five areas: operational/routine observations, research observatories , observational technique development, a commons for ocean information, and outreach/education. NOPP funded activities are those that are either solicited or managed by NOPP and involve support from two or more agencies. Overall investment in NOPP funded activities has increased significantly since the program's inception, reaching a total of $26 million in FY 2002. From FY 1997 to FY

2002, NOPP has funded 82 projects, including 20 renewal projects, in response to Broad Agency Announcements and Requests for Proposals. Of the total funds awarded during this period, approximately 62%, 18%, 11% and 9% went to academia, government, industry and non-governmental organizations/others, respectively. In addition to NOPP funded activities, individual agencies invest in NOPP related activities, which are funded primarily by a single agency in response to plans produced by NOPP entities. Examples include a military ocean survey using academic research vessels and several projects related to the development of an Integrated Ocean and Observing System (IOOS), which is coordinated through a NOPP interagency office called Ocean. US. Significant new investments in NOPP related activities are anticipated over the next decade.
DTIC
Economic Development; Leadership; Oceanographic Parameters; Oceanography

20080014480 Naval Postgraduate School, Monterey, CA USA
Cyber-Herding and Cyber Activism: Countering Qutbists on the Internet
Moon, David B; Dec 2007; 73 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475919; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475919

The Internet provides Islamic militants ('Qutbists') a golden opportunity to bypass normal media outlets and take their message directly to the people. This allows them to spread their ideas to an ever-growing audience. What should be done about these web sites has been the focus of an ongoing debate. Some advocate shutting down these web sites while others prefer to monitor them for information. Both views have merit, and both have problems. The purpose of this thesis is to propose and evaluate three strategies for countering Qutbists on the internet: a covert active strategy of cyber-herding, an overt passive strategy of cyber activism, and a combination of these two strategies.
DTIC
Internets; Warfare

20080014490 Naval Postgraduate School, Monterey, CA USA
Web-Based Naval Fleet Logistics Information System
Li, Yanfeng; Dec 2007; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475943; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475943

Shipboard Supply Officers training focuses on maintaining accountability and very little on operational logistics, which is only presented at predeployment briefs that last one or two days. Many Supply Officers suffer information overload during these briefs, thus making the effectiveness of the briefs questionable. On the other hand, there is insufficient information on port services and lessons learned for effective planning. This project proposes the implementation of a Web-Based Logistics Information System to act as a single platform for Naval supply chain and shipboard customers for effective logistics planning and execution, and as an information system for corporate knowledge management. The capability of a Web-based system will optimize Naval supply chain operations, significantly reduce man-hours, provide a mechanism for continuous process improvement, and enable the Naval supply system to become a learning organization.
DTIC
Information Systems; Logistics; Military Operations

20080014493 Naval Postgraduate School, Monterey, CA USA
Paperless Policy: Digital Filing System Benefits to DoD Contracting Organizations
Sherman, Brad J; Freeman, Eric; Dec 2007; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475950; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475950

The year 2000 was the cutoff date for the Department of Defense (DoD) to have paperless processes in place. Since then, advances in computer technology have led to such paperless contracting processes as the DoD-wide Standard Procurement System (SPS), Wide Area Work Flow, and other department-specific major weapon procurement information systems. Although great strides were made by the DoD to implement paperless contracting processes, there still exists substantial room for improvement. Despite the use of all of the paperless system processes, now, seven years beyond the paperless cutoff date, many organizations still use a paper-based filing system. This thesis will explore the policy and benefits of implementing a paperless contracting filing system using a software program such as Adobe Acrobat(trade mark), provide a brief assessment

of current Air Force and Navy/Marine contract filing systems, and include a real-world case study of the implementation of a paperless policy change at the Los Angeles Air Force Base (LAAFB).
DTIC
Defense Program; Digital Systems; Government Procurement; Organizations

20080014502 Naval Postgraduate School, Monterey, CA USA
Locating and Searching Electronic Documents: A User Study of Supply Publications in the USA Marine Corps
Stahl, Scott A; Dec 2007; 109 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475967; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475967

This exploratory study assesses the usability of an online policy document system, specifically with company grade supply officers in the U.S. Marine Corps. Using common work scenarios, users were asked to search for specific policy documents. Their efforts to navigate through the system were recorded and analyzed to better understand areas in the system that posed challenges to supply officers' efforts at policy retrieval and understanding. The primary purpose of the study is to provide recommendations, based on the test findings, that will address opportunities to enhance the effectiveness and efficiency of the current electronic publication system. Based on this analysis, the second purpose of the study is to provide recommendations to enhance the effectiveness, efficiency, and user satisfaction with the electronic document system. Five participants were observed as they used electronic policy and regulatory documents related to financial management and property control functions. The participants were chosen because they represent the user population and are familiar with the electronic document system. Each participant conducted typical search and retrieval tasks using think-aloud protocols. Each session was videotaped, and participants were interviewed afterwards. In-depth analysis of the data indicates that participants are generally satisfied with the system, but significant opportunities exist to improve its effectiveness and efficiency. The most notable recommendations are as follows: increase search capability, provide consolidated offering of content, allow personalization and portability, improve ability to see context/location within documents, create additional linking mechanisms, and migrate away from .pdf file format. Additional recommendations address the need for iterative testing and triangulation of problem areas to increase data reliability.
DTIC
Data Bases; Information Retrieval; Information Systems; Policies; Position (Location); Regulations; United States

20080014512 Naval Postgraduate School, Monterey, CA USA
An Organizational Assessment of the USA Military's Ability to Control the Electromagnetic Spectrum in the 21st Century
Acquaro, Philip F; Dec 1, 2007; 143 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475994; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475994

The USA (U.S.) has the best-trained and equipped military in the world; however, these factors do not necessarily equate to success in operations. Information is a vital component of warfare that facilitates success. Electronic warfare (EW) organizations in the U.S. military are tasked to control battlefield information flow throughout the range of military operations. Historically, the U.S. has effectively accomplished this mission; however, recent events reveal symptoms of a decline in America's ability to exploit, attack, and protect information systems. This thesis executed a contingency theory based organizational analysis of command level EW organizations responsible for EW plans and management within the Department of Defense. The collective assessment using the combined open systems model and ORGCON (Burton et al., 1998) expert system revealed the organization has not adequately adjusted to the dynamic environment of the twenty first century. Implementation of recommended changes to the EW strategic task, leadership rank structure, education system, and division of EW may assist the U.S. military to maintain its information advantage in future operations.
DTIC
Contingency; Electromagnetic Spectra; Electronic Warfare; Organizations; United States

20080014514 Naval Postgraduate School, Monterey, CA USA
A Market Analysis of Publications, Trade Conferences, and Key Events for Fleet Readiness Center Southwest
Endress, Jason; Guptill, Scott; Valencia, Rogelio; Dec 2007; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A475998; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475998

The purpose of this MBA Project is to develop a well-defined process to ensure reasonable access to industry publications

for Fleet Readiness Center Southwest (FRCSW) through the compilation of a user-friendly database. For each of the targeted publications, the project team determined the individual publication's requirements, content interest(s), and outlined the publication's preferred method for article/press release submission and publication. The project team identified industry trade conferences, events, and other promotional opportunities that would be appropriate for FRCSW to consider for participation. This project was conducted with the assistance of FRCSW and faculty at the Naval Postgraduate School. Key areas of concern are: defining a logical process to indicate preferred publications, conferences, and key events for FRCSW participation, developing a database that is both easy to use and comprehensive, and finding ample research information to effectively analyze data. Recommendations are made and incorporated into the final database. This database can be used by FRCSW as a reference guide to expedite and simplify the process of choosing proper publications, conferences, and events for marketing and article submission.
DTIC
Conferences; Data Bases; Research Management

20080014550 General Accounting Office, Washington, DC USA
DEFENSE ACQUISITIONS: Departmentwide Direction is Needed for Implementation of the Anti-tamper Policy
Jan 2008; 26 pp.; In English
Report No.(s): AD-A476087; GAO-08-91; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476087

To protect its critical assets, DOD has established several protection measures for weapon systems. These measures include information assurance to protect information and information systems, software protection to prevent the unauthorized distribution and exploitation of critical software, and anti-tamper techniques to help delay exploitation of technologies through means such as reverse engineering3 when U.S. weapons are exported or lost on the battlefield. Examples of anti-tamper techniques include software encryption, which scrambles software instructions to make them unintelligible without first being reprocessed through a deciphering technique, and hardware protective coatings designed to make it difficult to extract or dissect components without damaging them.4 In 1999, the Under Secretary of Defense for Acquisition, Technology, and Logistics (AT&L) issued a policy memorandum for implementing antitamper protection in acquisition programs. In the following year, AT&L issued a policy memorandum stating that technologies should be routinely assessed during the acquisition process to determine if they are critical and if anti-tamper techniques are needed to protect these technologies. In 2001, an AT&L policy memorandum designated the Air Force as the Anti-Tamper Executive Agent. The executive agent's office, which currently has four staff, is responsible for implementing DOD s anti-tamper policy and managing anti-tamper technology development through the Air Force Research Laboratory. The executive agent also holds periodic information sessions to educate the acquisition community about anti-tamper policy, initiatives, and technology developments. To coordinate activities, military services and defense agencies, such as the Missile Defense Agency, have an anti-tamper point of contact. Program managers are responsible for ensuring anti-tamper protection is incorporated on any weapon system with critical technologies that need protection.
DTIC
Acquisition; Policies

20080014556 Library of Congress, Washington, DC USA
Security Classified and Controlled Information: History, Status, and Emerging Management Issues
Relyea, Harold C; Jan 2, 2008; 37 pp.; In English
Report No.(s): AD-A476102; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476102

The security classification regime in use within the federal executive branch traces its origins to armed forces information protection practices of the World War I era. The classification system designating information, according to prescribed criteria and procedures, protected in accordance with one of three levels of sensitivity, based on the amount of harm to the national security that would result from its disclosure attained a presidential character in 1940 when President Franklin D. Roosevelt issued the initial executive order prescribing these information security arrangements. Refinements in the creation, management, and declassification of national security information followed over the succeeding decades, and continue today. In many regards, these developments represent attempts to narrow the bases and discretion for assigning official secrecy to executive branch documents and materials. Limiting the quantity of security classified information has been thought to be desirable for a variety of important reasons: (1) promoting an informed citizenry, (2) effectuating accountability for government policies and practices, (3) realizing oversight of government operations, and (4) achieving efficiency and economy in government management. Because security classification, however, was not possible for some kinds of information deemed

in some quarters to be 'sensitive,' other kinds of designations or markings came to be applied to alert federal employees regarding its privileged or potentially harmful character. Sometimes these markings derived from statutory provisions requiring the protection of a type of information; others were administratively authorized with little detail about their use.
DTIC
Classifications; Security

20080014665 Library of Congress, Washington, DC USA
Freedom of Information Act (FOIA) Amendments: 110th Congress
Relyea, Harold C; Jan 7, 2008; 19 pp.; In English
Report No.(s): AD-A476147; CRS-RL32780; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Enacted in 1966 after 11 years of investigation, legislative development, and deliberation in the House and half as many years of such consideration in the Senate, the Freedom of Information Act (FOIA) displaced the ineffective public information section of the Administrative Procedure Act. The FOIA was designed to enable any person individual or corporate, regardless of citizenship - to request, without explanation or justification, presumptive access to existing, identifiable, unpublished, executive branch agency records on any topic. The statute specified nine categories of information that may be permissibly exempted from the rule of disclosure. Disputes over the accessibility of requested records could be ultimately settled in court. Not supported as legislation or enthusiastically received as law by the executive branch, the FOIA was subsequently refined with direct amendments in 1974, 1976, 1986, and 1996. The statute has become a somewhat popular tool of inquiry and information gathering for various quarters of American society - the press, business, scholars, attorneys, consumers, and environmentalists, among others - as well as some foreign interests. The response to a request may involve a few sheets of paper, several linear feet of records, or perhaps information in an electronic format. Such responses require staff time, search and duplication efforts, and other resource commitments. Agency information management professionals must efficiently and economically service FOIA requests, doing so, of late, in the sensitized homeland security milieu. Requesters must be satisfied through timely supply, brokerage, or explanation. Simultaneously, agency FOIA costs must be kept reasonable. The perception that these conditions are not operative can result in proposed new corrective amendments to the statute.
DTIC
Information Retrieval; United States

20080014684 Library of Congress, Washington, DC USA
Afghanistan: Challenges and Options for Reconstructing a Stable and Moderate State
Cronin, Richard P; May 10, 2002; 47 pp.; In English
Report No.(s): AD-A476227; CRS-RL31389; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S.-led effort to end Afghanistan s role as host to Osama bin Laden and other anti-western Islamic terrorists requires not only the defeat of the Taliban but also the reconstruction of a stable, effective, and ideologically moderate Afghan state. Otherwise, the country could continue to be a potential base for terrorism and a source of regional instability. An important beginning was made with the December 22, 2001, installation of a multi-ethnic interim Afghan administration under Hami Karzai, following U.N.-sponsored negotiations in Bonn, Germany. An ethnic Pushtun with ties to the former royal family, Karzai has gained the nominal support of major regional warlords, but his leadership remains dangerously dependent on his status as a compromise figure. who can attract foreign assistance while not posing a threat to the warlords and other armed contenders for power. Moreover, the viability of the process set in motion in Bonn has yet to be established, especially the outcome of an Emergency Loya Jirga (Grand Council) which is to appoint a Transitional Authority in June 2002, with the task of drafting a new constitution, and the holding of national elections by about December 2003. The Bush Administration and the Congress have indicated strong support for humanitarian relief and reconstruction, but the precise nature of the U.S. role remains to be determined. As of late April 2002, the Bush Administration was focusing on the military campaign and rhetorically opposed to deep involvement in nation building. U.S. forces reportedly have been deeply involved in checking conflict among competing local warlords, an informal peacekeeping role that puts American troops at risk of embroilment in local power struggles and also involved with Afghan forces that potentially are a threat to the Interim Administration.
DTIC
Afghanistan; Leadership

20080014686 University of Southern Illinois, Carbondale, IL USA
New Media and the Military's Message
Pampe, Carla A; Nov 2007; 80 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476241; CI08-0004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In a study of the USA military's current methods of message communication, it is important to understand its long and

constantly evolving relationship with the press in the U.S., and its traditional means of disseminating information. In addition, an understanding of public relations practices and methods of communicating is necessary. This chapter will examine the history and evolution of the relationship between the U.S. military and the press, and provide a brief overview of public relations practices and use of evolving technology as a means of information dissemination.
DTIC
Information Transfer; Messages; Public Relations

20080014695 Air Command and Staff Coll., Maxwell AFB, AL USA
The Death of Information Operations: Making the Case for Non-Kinetic Operations
Robinson, Kelly G; Apr 2005; 39 pp.; In English
Report No.(s): AD-A476299; AU/ACSC/36-2114/2004-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Across the Air Force, Airmen agree that Information Operations 'IO' is a topic worthy of our attention, but few Airmen can agree on exactly what IO is. The primary source of this confusion traces back to the very label we are using. The word information in its name implies a direct and exclusive relationship between IO and Information Superiority as well as the Information Domain. Another contributing factor is the persistent confusion between influence capabilities, provided by IO, and influence effects, the essence of all warfare. In the end, reliance on information as the common denominator for this set of capabilities eventually led to IO tribalism within the Air Force and an inefficient 'everything is IO' mindset. If Air Force IO is going to provide relevant and useful engagement options to commanders, it must bring specific capabilities to the fight not already clearly defined in our air warfare, space operations, or mobility doctrine. The Air Force made significant progress by streamlining its version of IO in January 2005, but still did not clearly define a replacement for information as the entrance qualifier for IO doctrine. Without a common 'glue' to bind these capabilities, IO is simply a conglomeration of unrelated and otherwise orphaned mission areas. This research paper examines IO concept development over the last decade and investigates some of the problems resulting from recent Air Force IO terminology and doctrine. Based on a vision for the seamless integration of kinetic and non-kinetic capabilities, this paper proposes discarding the misnomer IO in favor of a new term, 'Non-Kinetic Operations'. More than just a name change, this new label represents the glue that binds Electronic Warfare, Influence Operations, and Network Warfare Operations.
DTIC
Death; Information Systems

20080014711 RAND Corp., Santa Monica, CA USA
Navy/OSD Collaborative Review of Acquisition Policy for DoD C3I and Weapon Programs
Gonzales, Daniel; Landree, Eric; Hollywood, John; Berner, Steven; Wong, Carolyn; Jan 2007; 85 pp.; In English
Contract(s)/Grant(s): W74V8H-06-C-0002
Report No.(s): AD-A476330; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of the project is to review current DoD policy governing the development and upgrade of interoperable command, control, communication, and intelligence (C3I) and weapon systems. Our focus, therefore, is those elements of DoD policy that pertain to the IT component of these programs. We reviewed this policy area to identify ambiguities, conflicts, overlaps, and shortfalls in these policies and to recommend solutions for clarifying the ambiguities, mitigating the shortfalls, filling the gaps, and resolving the conflicts we found in the policy statements. We examined five policy areas that apply to the interoperability of C3I and weapon systems. We started by looking at the requirement-gathering process. The current process is governed by requirement policy as defined in the Joint Capabilities Integration and Development System (JCIDS) documentation. Next, we reviewed DoD acquisition policy as determined by DoD 5000 series documentation, as well as several recent studies of the acquisition system that identify where current policy may be deficient and can be improved. Following acquisition, we turned our focus to examining interoperability and supportability policy that has been developed and recently revised specifically for IT systems. Next, we examined a new policy area designed to enhance and ensure the effective integration of global information grid (GIG) component programs so they perform effectively as an end-to-end (E2E) system of systems. Policies in this new area are in the net-centric implementation documents (NCIDs). Finally, we examine information assurance (IA) policy.
DTIC
Acquisition; Defense Program; Navy; Policies

20080014719 National Defense Univ., Washington, DC USA

DOD Future Energy Resources. Proceedings of Workshops Held at the National Defense University

May 2003; 90 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476355; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As we enter the 21st century, the Department of Defense (DOD) remains critically dependent on oil from petroleum for operational energy and for all force projection. Although this has worked well historically, with DOD simply being one of the major consumers of commercial energy sources, there are concerns that this picture may not continue throughout the 21st century. In response to concerns about U.S. and global depletion of cheap petroleum resources and the particular impact of this on future DOD energy resource needs, a series of workshops were held during 2002 and 2003 at National Defense University. These workshops were specifically aimed at the policy, geopolitics, economics, and technological aspects of future energy supply and demands, attempting to answer questions about the possible need for DOD engagement with industry and with the Department of Energy (DOE) on future energy resource issues. Particular issues addressed in the workshops and in this report include: the role of DOD in current and near future development by the oil and gas industry; the role of DOD in national and international future energy programs; how estimates of future availability and cost of hydrocarbon fuels will impact DOD; the need for a DOD long term strategy and policy regarding potential energy shortages; and the effects of environmental constraints on DOD energy options. The first workshop concluded that the major DOD requirement for energy in the next 50 years would remain liquid hydrocarbons, but that there was grave disagreement as to whether this requirement could continue to be met as it has in the past. This led to the further conclusion that DOD would be very wise to begin to more closely monitor this situation and take appropriate actions as necessary. The remaining three workshops in the series focused on potential future energy replacements for oil with an emphasis on DOD needs.

DTIC

Conferences; Defense Program; Energy Consumption

20080015387 National Defense Univ., Washington, DC USA

Strategic Fragility: Infrastructure Protection and National Security in the Information Age (Defense Horizons, Number 59, Jan 2008)

Miller, Robert A; Lachow, Irving; Jan 2008; 7 pp.; In English

Report No.(s): AD-A476034; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476034

Modern societies have reached unprecedented levels of prosperity, yet they remain vulnerable to a wide range of possible disruptions. One significant reason for this growing vulnerability is the developed world's reliance on an array of interlinked, interdependent critical infrastructures that span nations and even continents. The advent of these infrastructures over the past few decades has resulted in a tradeoff: the USA has gained greater productivity and prosperity at the risk of greater exposure to widespread systemic collapse. The trends that have led to this growing strategic fragility show no sign of slowing. As a result, the USA faces a new and different kind of threat to national security. This paper explores the factors that are creating the current situation. It examines the implications of strategic fragility for national security and the range of threats that could exploit this condition. Finally, it describes a variety of response strategies that could help address this issue. The challenges associated with strategic fragility are complex and not easily resolved. However, it is evident that policymakers will need to make difficult choices soon; delaying important decisions is itself a choice, and one that could produce disastrous results.

DTIC

Horizon; Protection; Security; Vulnerability

20080015392 National Defense Univ., Washington, DC USA

Implementing DOD's International Science and Technology Strategy

Daniel, Donald C; Loeb, Cheryl A; Feb 2006; 16 pp.; In English

Report No.(s): AD-A476049; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA476049

The USA Department of Defense has recently published its first international science and technology (S&T) strategy. This much needed document provides top-level guidance to all elements of the DOD S&T enterprise and, as a publicly released document, is also intended to be useful to the many international allies and partners of the USA. At approximately $13 billion a year, the American defense S&T program is the largest in the world and now exceeds the total defense budget of all but ten nations worldwide. It is the wellspring of the Nation's unprecedented technical superiority. The extensive programs supported by this budget generate the technology base from which the USA develops, acquires, and maintains a vast array of worldwide capabilities. Although at lower, but still significant levels, the activities of the global defense S&T community also enhance

military capabilities of existing and potential partners and allies. Not only are the enhanced capabilities of these nations of significant value to the USA in potential coalition operations but, through information sharing and other activities, but the scientific and technical results that have produced these capabilities can directly benefit to the USA in its own science and technology program. As can be seen from the recently released 'International Science and Technology Strategy for the USA Department of Defense,' the network for worldwide sharing of defense S&T information is vast, and the new strategy provides an excellent framework to maximize this potential. This paper provides some specific thoughts on implementation and how certain steps might benefit all involved.
DTIC
Defense Program; Military Technology; Research and Development; Technologies

20080015399 Army Research Inst. for the Behavioral and Social Sciences, Fort Benning, GA USA
Unit Information Management Practices at the Joint Readiness Training Center
Evans, Kenneth L; Reese, Richard P; Weldon, Louis; Nov 2007; 30 pp.; In English
Contract(s)/Grant(s): Proj-A790
Report No.(s): AD-A476071; ARI-RR-1879; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA476071

The present investigation sought to quantify unit information management (IM) practices at the Joint Readiness Training Center (JRTC) and to determine the extent to which a job performance aid, the IM Guide, might improve unit IM performance. IM practices were measured by observer/controllers using the IM Checklist, a tool developed especially for the investigation. Over the course of seven unit rotations at JRTC, 758 checklists were collected and analyzed. The IM Guide was found to be of benefit to companies, but not to either battalions or platoons. Overall, units were able to address specified information requirements fairly well, though they had much greater difficulty answering implied requirements. In terms of information quality, units were better at providing accurate and reliable information than they were at providing complete and precise information. Units that included IM in their planning process and units that rehearsed their communication plans were more likely to have IM that enhanced mission accomplishment than units that did not do those two things.
DTIC
Education; Human Performance; Information Management; Information Systems; Organizations; Procedures; Telecommunication

20080015416 Mitre Corp., McLean, VA USA
Prospects and Possibilities for Ontology Evaluation: The View from NCOR
Obrst, Leo; Hughes, Todd; Ray, Steve; May 2006; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A476124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this position paper, we briefly describe the perspective of the US National Center for Ontological Research (NCOR) on ontology evaluation. NCOR's inauguration was recently held (October 2005), and at that time goals were identified and committees formed to pursue those goals, including the Ontology Evaluation Committee. This committee is charged with developing a plan for the evaluation of ontologies that is designed to transform ontological engineering into a true scientific and engineering discipline. This paper discusses some issues on ontology evaluation, including the relevant questions to ask, and suggests some approaches.
DTIC
Standardization; Information Management

20080015490 Office of Inspector General, Arlington, VA USA
Outcome, Cost, and Oversight of Reconstruction of Taji Military Base and Baghdad Recruiting Center
Jan 15, 2008; 42 pp.; In English
Report No.(s): AD-A475833; SIGIR-08-994; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475833

A December 2006 amendment to the Special Inspector General for Iraq Reconstruction's (SIGIR) enabling legislation requires that, prior to its termination, SIGIR prepare a final forensic audit report on funds made available to the Iraq Relief and Reconstruction Fund. To help meet this requirement, SIGIR is undertaking a series of focused audits examining major Iraq reconstruction contracts. The objective of these audits is to examine contract outcome, cost, and management oversight, emphasizing issues related to vulnerabilities to fraud, waste, and abuse. This report, another in the series, examines reconstruction work contracted for by the U.S. Government and performed by Parsons Infrastructure & Technology Group,

Inc. (Parsons) of Pasadena, California. It complements other SIGIR audit work related to Iraq reconstruction done by Parsons and other contractors. In some cases, including this one, contractors have completed their work and been paid. Future reports will address other Iraq reconstruction projects. In January 2004, at the request of the Coalition Provisional Authority, the Air Force Center for Environmental Excellence now known as the Air Force Center for Engineering and the Environment (AFCEE) awarded a cost-plus fixed-fee task order under an existing contract to Parsons. Under the task order, Parsons was to renovate and replace facilities and provide infrastructure repairs at the Taji Military Base, and the recruiting stations in Hillah, Kirkuk, and Ba quba. It was also to construct a logistical support facility at the Kirkush Military Training Base. Subsequent modifications to the task order altered the scope of work. They eliminated the requirements to renovate the three recruiting stations, and the logistical support facility at the Kirkush base. Modifications also increased the scope of work at the Taji Military Base and added a requirement to renovate the Baghdad Recruiting Center, which had recently been bombed. DTIC

Costs; Logistics Management

20080015494 Army Medical Research and Materiel Command, Fort Detrick, MD USA

NATO Multinational Medical Operations and the Requirement for Interoperability and Data Exchange

Lam, David M; Mar 1, 2007; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A476386; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Interoperability; Medical Services; Military Operations; North Atlantic Treaty Organization (NATO); Standardization

20080015610 Army Chemical Materials Agency, Aberdeen Proving Ground, MA USA

Chemical Weapons Convention

Apr 29, 1997; 3 pp.; In English

Report No.(s): AD-A476357; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On April 29, 1997, the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction, known as the Chemical Weapons Convention (CWC), entered into force. At that time, the USA and 86 other nations became the first countries to sign and ratify the CWC. In doing so, the USA agreed to destroy all their chemical weapons and former chemical weapons production facilities and to abide by prohibitions from development, use, production and acquisition of chemical weapons. Today, more than 170 nations have ratified the CWC. Since entry into force of the CWC, the USA has destroyed more than 1.4 million munitions and more than 10,000 metric tons of chemical agent, representing more than 35 percent of its chemical weapons stockpile. The USA has also destroyed all of its unfilled munitions and binary projectiles and 12 of 14 former chemical weapons production facilities in compliance with CWC deadlines. The U.S. Army Chemical Materials Agency (CMA) is responsible for safely destroying the majority of the remaining U.S. chemical weapons and related materials that are the legacy of our nation's past chemical weapons production. Additional responsibility for destroying U.S. chemical weapons stored at Army installations in Kentucky and Colorado falls under the U.S. Department of Defense s Assembled Chemical Weapons Alternatives Program. Achievements DTIC

Chemical Warfare; Conventions

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*.

20080014251 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Science Opportunity Analyzer (SOA): Science Planning Made Simple

Streiffert, Barbara A.; Polanskey, Carol A.; November 8, 2004; 22 pp.; In English; Core Technologies for Space Systems, 8 Nov. 2004, Colorado Springs, CO, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40691

.For the first time at JPL, the Cassini mission to Saturn is using distributed science operations for developing their experiments. Remote scientists needed the ability to: a) Identify observation opportunities; b) Create accurate, detailed designs for their observations; c) Verify that their designs meet their objectives; d) Check their observations against project flight rules and constraints; e) Communicate their observations to other scientists. Many existing tools provide one or more of these

functions, but Science Opportunity Analyzer (SOA) has been built to unify these tasks into a single application. Accurate: Utilizes JPL Navigation and Ancillary Information Facility (NAIF) SPICE* software tool kit - Provides high fidelity modeling. - Facilitates rapid adaptation to other flight projects. Portable: Available in Unix, Windows and Linux. Adaptable: Designed to be a multi-mission tool so it can be readily adapted to other flight projects. Implemented in Java, Java 3D and other innovative technologies. Conclusion: SOA is easy to use. It only requires 6 simple steps. SOA's ability to show the same accurate information in multiple ways (multiple visualization formats, data plots, listings and file output) is essential to meet the needs of a diverse, distributed science operations environment.
Derived from text
Cassini Mission; Navigation; Flight Rules; Format

20080014252 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Huygens Probe Relay Data Subsystem Anomaly and Recovery
Maize, Earl H; September 25, 2004; 11 pp.; In English; American Institute of Aeronautics and Astronautics (AIAA), 28-30 Sep. 2004, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40686

European Space Agency Mission is designed to study the atmosphere and surface of Saturn's largest satellite, Titan carried by the Cassini spacecraft which provides: a) Power for support equipment; b) S-band antenna system; and c) Data storage and playback. Instruments/investigations include: 1) Aerosol Collector Pyrolyzer (ACP). Study of clouds and aerosols in the Titan atmosphere. 2) Descent Imager and Spectral Radiometer (DISR). Aerosol and cloud optical properties and spectroscopy measurements of Titan's atmosphere and surface. 3) Doppler Wind Experiment (DWE). Study of winds from their effect on the Probe during Titan descent. 4) Gas Chromatograph and Mass Spectrometer (GCMS). Chemical composition of gases and aerosols in Titan's atmosphere. 5) Huygens Atmospheric Structure Instrument (HASI). In-situ study of Titan atmospheric physical and electrical properties. 6) Surface Science Package (SSP). Physical properties of Titan's surface and related atmospheric properties.
Derived from text
Cassini Mission; Huygens Probe; Titan; Satellite Atmospheres; Data Storage; Cloud Physics; Radiometers; Atmospheric Physics; Space Missions

20080014277 NASA Marshall Space Flight Center, Huntsville, AL, USA
Defining the Natural Atmospheric Environment Requirements for the NASA Constellation Program
Roberts, Barry C.; Leahy, Frank; January 20, 2008; 14 pp.; In English; 13th Conference on Aviation, Range and Aerospace Meteorology, 20-24 Jan. 2008, New Orleans, LA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014277

The National Aeronautics and Space Administration began developing a new vehicle under the Constellation Program to replace the Space Shuttle. The Ares-1 launch vehicle and the Orion capsule will be used to ferry crew and some payloads to the International Space Station and will also be used for new missions to the moon, As development of this new vehicle begins, the Natural Environments Branch at Marshall Space Flight Center has been tasked with defining the natural environments the vehicle will encounter and working with the program to develop natural environmental requirements for the vehicles' elements. An overview of the structure of the program is given, along with a description of the Constellation Design Specification for Natural Environments and the Constellation Natural Environments Definition for Design documents and how they apply to the Ares-I and Orion vehicles.
Author
Constellation Program; Ares 1 Launch Vehicle; Space Shuttles; NASA Programs; Payloads

20080014332 NASA Marshall Space Flight Center, Huntsville, AL, USA
Space Science Research and Technology at NASA's Marshall Space Flight Center
Johnson, Charles L.; November 1, 2007; 1 pp.; In English; Colloquium at City Technical College, 1-2 Nov. 2007, Brooklyn, NY, USA; No Copyright; Avail.: Other Sources; Abstract Only

This presentation will summarize the various projects and programs managed in the Space Science Programs and Projects Office at NASA's Marshall Space Flight Center in Huntsville, Alabama. Projects in the portfolio include NASA's Chandra

X-Ray telescope, Hinode solar physics satellite, various advanced space propulsion technologies, including solar sails and tethers, as well as NASA's Discovery and New Frontiers Programs.
Author
Aerospace Engineering; Research and Development; NASA Programs; Aerospace Sciences

20080014343 NASA, Washington, DC, USA
Ask Magazine
Prusak, Laurence, Editor; Cohen, Don, Editor; Ellis, Kerry, Editor; Kohut, Matt, Editor; Winter 2008; 56 pp.; In English; See also 20080014344 - 20080014357; Original contains color and black and white illustrations
Report No.(s): NP-2008-02-494-HQ; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014343

The topics covered include: The Summer of Hydrogen; Leading Your Leaders; Dawn: Cooperation, not Control; Best Buy: Planning for Disaster The Astronaut Glove Challenge: Big Innovation from a (Very) Small Team; Using the Space Glove to Teach Spatial Thinking; The Power of Story; Interview with Jay O'Callahan; Learning from Space Entrepreneurs; Featured Invention: Laser Scaling Device; Reaching for the APEX at Ames; The Project Manager Who Saved His Country; Choosing and Developing the Right Leadership Styles for Projects; and The Costs of Knowledge.
Derived from text
Management Methods; Astronauts; Hydrogen; Leadership; Lasers; Disasters

20080014346 NASA, Washington, DC, USA
Learning from Space Entrepreneurs
Pomerantz, William; Ask Magazine; Winter 2008, pp. 33-37; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014346

The early days of rocketry and space exploration in the USA were marked by incredibly rapid progress: a seemingly endless parade of firsts. Not coincidentally, this period also saw more than its fair share of failure, especially in the infamous 'kaputnik' days prior to the successful launch of Explorer. Without a standard canon of known quantities to turn to, the early pioneers of rocketry and space flight were forced to dream up new ideas that ranged from the elegant to the bizarre and to accept the fact that the price of radical progress is occasional failure. Nowadays, rapid prototyping and testing have slowed, as we rely more and more on the extensive knowledge pined by our predecessors and on the embarrassment of riches modern engineers get from computational modeling and computer assisted design. In many cases, this leads to much improved or phenomenally more efficient designs. It also, however, fosters a culture so terrified of failure that we over-engineer and overanalyze everything, often tweaking designs for decades before a new system takes flight. (This is not a problem unique to rockets; the same phenomenon seems to have occurred in high-performance jets.) This is one reason why it was possible for President Kennedy to dream of the completion of the Mercury and Gemini missions and a successful landing on the moon in under a decade, while returning to the moon may take nearly twice as long. Lacking access to the tremendous computational resources of the national space program-and, just as importantly, removed from the harsh judgment of public shareholders or congressional appropriations committees-the hungry entrepreneurs who compete for our prizes tend not to display such fear of failure. Instead, most of them follow a rapid 'build, test, fly' program. They are willing to throw a handful of concepts against the wall and see what sticks. They often go from drawing on the back of a napkin to firing engines or even flying vehicles in a matter of weeks or months, learning valuable lessons along the way. Indeed, our teams have repeatedly learned many of the most valuable lessons after only a few moments of working with real hardware-lessons that could never have been learned from a CAD drawing, like finding the failure modes of different welding practices or tracking down the interference between an onboard camera and a GPS unit. As Paul Breed, the leader of a Northrop Grumman Lunar Lander Challenge team (playfully called Unreasonable Rocket), is fond of saying, 'In computer simulations the plumbing never leaks. In real life, it always does.'
Derived from text
Engineers; Space Programs; Space Exploration; Pioneer Space Probes; Computerized Simulation; Failure Modes; Global Positioning System; Rapid Prototyping

20080014351 NASA, Washington, DC, USA
Featured Invention: Laser Scaling Device
Dunn, Carol Anne; Ask Magazine; Winter 2008, pp. 38-39; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014351

In September 2003, NASA signed a nonexclusive license agreement with Armor Forensics, a subsidiary of Armor Holdings, Inc., for the laser scaling device under the Innovative Partnerships Program. Coupled with a measuring program, also developed by NASA, the unit provides crime scene investigators with the ability to shoot photographs at scale without having to physically enter the scene, analyzing details such as bloodspatter patterns and graffiti. This ability keeps the scene's components intact and pristine for the collection of information and evidence. The laser scaling device elegantly solved a pressing problem for NASA's shuttle operations team and also provided industry with a useful tool. For NASA, the laser scaling device is still used to measure divots or damage to the shuttle's external tank and other structures around the launchpad. When the invention also met similar needs within industry, the Innovative Partnerships Program provided information to Armor Forensics for licensing and marketing the laser scaling device. Jeff Kohler, technology transfer agent at Kennedy, added, 'We also invited a representative from the FBI's special photography unit to Kennedy to meet with Armor Forensics and the innovator. Eventually the FBI ended up purchasing some units. Armor Forensics is also beginning to receive interest from DoD [Department of Defense] for use in military crime scene investigations overseas.'
Derived from text
Photography; Crime; Lasers; Inventions; Licensing; Marketing; Damage; Space Shuttle Orbiters; External Tanks

20080014352 Lockheed Martin Space Operations, USA
The Astronaut Glove Challenge: Big Innovation from a (Very) Small Team
Homer, Peter; Ask Magazine; Winter 2008, pp. 20-23; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy

Many measurements were taken by test engineers from Hamilton Sundstrand, the prime contractor for the current EVA suit. Because the raw measurements needed to be converted to torques and combined into a final score, it was impossible to keep track of who was ahead in this phase. The final comfort and dexterity test was performed in a depressurized glove box to simulate real on-orbit conditions. Each competitor was required to exercise the glove through a defined set of finger, thumb, and wrist motions without any sign of abrasion or bruising of the competitor's hand. I learned a lot about arm fatigue! This was a pass-fail event, and both of the remaining competitors came through intact. After taking what seemed like an eternity to tally the final scores, the judges announced that I had won the competition. My glove was the only one to have achieved lower finger-bending torques than the Phase VI glove. Looking back, I see three sources of the success of this project that I believe also operate in other programs where small teams have broken new ground in aerospace technologies. These are awareness, failure, and trust. By remaining aware of the big picture, continuously asking myself, 'Am I converging on a solution?' and 'Am I converging fast enough?' I was able to see that my original design was not going to succeed, leading to the decision to start over. I was also aware that, had I lingered over this choice or taken time to analyze it, I would not have been ready on the first day of competition. Failure forced me to look outside conventional thinking and opened the door to innovation. Choosing to make incremental failures enabled me to rapidly climb the learning curve. Trusting my 'gut' feelings-which are really an internalized accumulation of experiences-and my newly acquired skills allowed me to devise new technologies rapidly and complete both gloves just in time. Awareness, failure, and trust are intertwined: failure provides experiences that inform awareness and provide decision-making opportunities that build trust among team members and managers while opening minds to new pathways for development. All three are necessary for teams-large or small-to achieve big innovation.
Derived from text
Astronauts; Gloves; Aerospace Engineering; Sensory Feedback; Learning Curves; Fingers; Extravehicular Activity; Torque

20080014356 NASA, Washington, DC, USA
Interview with Jay O'Callahan
Cohen, Don; Ask Magazine; Winter 2008, pp. 29-32; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014356

Usually stories have elements of risk, trouble, challenge, adventure. These elements are universal because they're part of life. A story gets exciting when someone takes a risk. With risk there's tension and with tension there's energy, and the energy draws us into who the story. NASA's work involves great risk. Sometimes, as with Challenger and Columbia, the result is

tragedy. I had a sense the astronauts were invulnerable. They were so well trained, and the engineers behind them were superb. Nothing was going to go wrong. That's one of the reasons the Challenger crew's death moved people so deeply. Christa McAuliffe was not an engineer; she was a teacher and she died, and the whole space enterprise became very human. The Challenger lifted off and in seventy-three seconds the Space Shuttle disintegrated. Seventy-three seconds. That's a day I'll remember, like the day of Kennedy's death. The danger was there, but we were lulled into thinking the space flight was routine. My firm: job would be to talk with MAS people-scientists, engineers, astronauts. I'm sure that underneath the whole NASA enterprise there is a sense of wonder. Perhaps science and myth are coming together in NASA. The myths of old were often stories about the sun, the stars, and the moon. Now with NASA, we're going out there. NASA is turning our eyes heavenward just as the ancients did.
Derived from text
Astronauts; Engineers; Space Shuttles; Risk; Instructors; Education

20080014357 Stellar Solutions, Inc., Palto Alto, CA, USA
Using the Space Glove to Teach Spatial Thinking
Lord, Peter; Ask Magazine; Winter 2008, pp. 24-26; In English; See also 20080014343; No Copyright; Avail.: CASI: A01, Hardcopy

The challenge of extending students' skills in spatial thinking to astronomical scales was the central focus of our K-8 curriculum development. When the project's lead teacher requested a curriculum that cumulatively built on each prior year's learning in a spiral fashion, I knew exactly what the school was asking for. Second and third graders began by noticing the cyclical patters that the sun, moon, and stars make in the sky. Fourth graders explored the phases of the moon by taking turns modeling and sketching them in their classroom and then comparing them to the real sky. Sixth !graders used real telescopes to observe a moving model of our solar system and walked a scale model of the planets' orbits. The curriculum is designed to expand students' capacity to visualize space in a hierarchical fashion that asks them to imagine themselves from a broader number of spatial perspectives through hands-on activities. The 'situational awareness' Peter's story describes is a hallmark of high-performance engineering and innovation. Keeping in mind the potential outcomes of multiple paths of pursuit from multiple perspectives while keeping track of their relative merits and performance requirements is a demanding spatial task. What made it possible for Peter to transform the failure of his first glove into triumph was the mental space in which that failure provided exactly the information needed for a new breakthrough. In at least two cases, Peter could immediately 'see' the full implications of what his hands were telling him. He tells the story of how putting his hands in a Phase VI astronaut glove instantly transformed his understanding of the glove challenge. Six months into his development, the failure of circumferentially wrapped cords to produce a sufficiently flexible glove again forced him to abandon his assumptions. His situational awareness was so clear and compelling it became a gut-level response. Peter's finely developed spatial skills enabled him to almost instinctively focus his full energy on a carefully constructed set of experiments. The finger's ability to sense pressure, force, and work gave him the immediate feedback required to solve this one central problem. Once properly understood, his failure quickly led to the magical 'Aha!' moment of discovery; the rest is history. Just as children need opportunities to develop hands-on understanding, engineers need to explore new possibilities through incremental hands-on failure. High-performance innovation is all about learning to make maximum use of thinking spatially to direct this process. Peter Homer's glove also reminds us that efficient engineering decisions need to be made as close to the hardware as possible. Whether we're doing hands-on education or hands-on engineering, it is when we trust in our ability to 'feel our way' through failure that we reach our highest potential.
Derived from text
Gloves; Astronauts; Education; Students; Scale Models; Fingers

20080014809 NASA Johnson Space Center, Houston, TX, USA
Controlling the Growth of Future LEO Debris Populations with Active Debris Removal
Liou, J.-C.; Johnson, N. L.; Hill, N. M.; [2008]; 1 pp.; In English; International Astronautical Federation Meeting, 29 Sep. - 3 Oct. 2008, Glasgow, Scotland, UK; Copyright; Avail.: Other Sources; Abstract Only

Active debris removal (ADR) was suggested as a potential means to remediate the low Earth orbit (LEO) debris environment as early as the 1980s. The reasons ADR has not become practical are due to its technical difficulties and the high cost associated with the approach. However, as the LEO debris populations continue to increase, ADR may be the only option to preserve the near-Earth environment for future generations. An initial study was completed in 2007 to demonstrate that a simple ADR target selection criterion could be developed to reduce the future debris population growth. The present paper summarizes a comprehensive study based on more realistic simulation scenarios, including fragments generated from the 2007 Fengyun-1C event, mitigation measures, and other target selection options. The simulations were based on the NASA

long-term orbital debris projection model, LEGEND. A scenario, where at the end of mission lifetimes, spacecraft and upper stages were moved to 25-year decay orbits, was adopted as the baseline environment for comparison. Different annual removal rates and different ADR target selection criteria were tested, and the resulting 200-year future environment projections were compared with the baseline scenario. Results of this parametric study indicate that (1) an effective removal strategy can be developed based on the mass and collision probability of each object as the selection criterion, and (2) the LEO environment can be stabilized in the next 200 years with an ADR removal rate of five objects per year.
Author
Low Earth Orbits; Space Debris; Earth Orbital Environments; Probability Theory; Fragments

20080014828 NASA Johnson Space Center, Houston, TX, USA
The New NASA Orbital Debris Mitigation Procedural Requirements and Standards
Johnson, Nicholas L.; Stansbery, Eugene G.; [2008]; 1 pp.; In English; International Astronautical Federation Meeting, 29 Sept. - 3 Oct. 2008, Glasgow, UK; No Copyright; Avail.: Other Sources; Abstract Only

NASA has issued major updates to its principal orbital debris mitigation policy directive and standards. The new NASA Procedural Requirements for Limiting Orbital Debris (NPR 8715.6), with its supporting NASA Standard 8719.14, both refine earlier orbital debris mitigation documents and in some areas expand their applicability. Organizational and individual responsibilities along with general directives are set forth in NPR 8715.6. New requirements include routine conjunction assessments for all maneuverable NASA spacecraft in LEO and GEO, prompt notifications of intended or unintended debris generation, preparation and maintenance of formal end-of-mission plans, and disposal of vehicles in operation around the Moon and Mars and at the Earth-Sun Lagrangian points. NASA Standard 8719.14 replaces the 1995 NASA Safety Standard 1740.14 with no major new requirements but with several refinements and additions, some of which had already been adopted. Compliance with human casualty risk limitations from reentering debris will be calculated explicitly and not be expressed in terms of average debris casualty area. Moreover, the minimum kinetic energy threshold for potentially injurious reentering debris is set at 15 Joules. The overarching requirement for the disposal of GEO spacecraft and launch vehicle orbital stages is to ensure that the vehicles do not come within GEO + 200 km for at least 100 km after end of mission, rather than setting specific requirements for the disposal orbit. Spacecraft operating in or routinely transiting LEO must remain in the region for no more than 25 years after end of mission or 30 years after launch, whichever occurs sooner. A comprehensive new NASA handbook on orbital debris has also been prepared to provide background on the orbital debris environment and the related NASA mitigation requirements and standards.
Author
Space Debris; Policies; Low Earth Orbits; Spacecraft Launching; Maneuverable Spacecraft; Lagrangian Function

20080015574 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Experimental Probe of Inflationary Cosmology: A Mission Concept Study for NASA's Einstein Inflation Probe
February 2008; 200 pp.; In English; Original contains color and black and white illustrations
Report No.(s): JPL 08-04; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40728

When we began our study we sought to answer five fundamental implementation questions: 1) can foregrounds be measured and subtracted to a sufficiently low level?; 2) can systematic errors be controlled?; 3) can we develop optics with sufficiently large throughput, low polarization, and frequency coverage from 30 to 300 GHz?; 4) is there a technical path to realizing the sensitivity and systematic error requirements?; and 5) what are the specific mission architecture parameters, including cost? Detailed answers to these questions are contained in this report.
Author
Cosmology; Space Probes; Mission Planning; Systematic Errors; Low Frequencies

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ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080014326 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Terrestrial Planet Finder Interferometer Science Working Group Report
Lawson, Peter R.; Lay, O. P.; Johnston, K. J.; Beichman, C. A.; March 2007; 215 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; 101743.09.01.01
Report No.(s): JPL Publ- 07-1; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080014326

Over the past two years, the focus of the project for the interferometric version of the Terrestrial Planet Finder (TPF-I) has been on the development of the scientific rational for the mission, the assessment of TPF-I architectures, the laboratory demonstration of key technologies, and the development of a detailed technology roadmap. The Science Working Group (SWG), in conjunction with European colleagues working on the European Space Agency s (ESA s) Darwin project, has reaffirmed the goals of TPF-I as part of a broad vision for the detection and characterization of Earth-like planets orbiting nearby stars and for the search for life on those planets. The SWG also helped to assess the performance of different interferometric configurations for TPF-I/Darwin. Building on earlier SWG reports, this document restates the scientific case for TPF-I, assesses suitable target stars and relevant wavelengths for observation, discusses dramatic new capabilities for general astrophysical observations, and summarizes how Spitzer has improved our knowledge of the incidence of zodiacal emission on the search for planets. This document discusses in some detail on laboratory advances in interferometric nulling and formation flying. Laboratory experiments have now achieved stable narrow- and broad-band nulling the levels of 10-6 and 2.0 10-5, respectively. A testbed has demonstrated formation flying using two realistic spacecraft mockups. With a suitably funded program of technology development, as summarized herein and described in more detail in the Technology Plan for the Terrestrial Planet Finder Interferometer (2005), the National Aeronautics and Space Administration (NASA) and ESA would be able to start within the coming decade a full-scale TPF-I/Darwin mission capable of finding Earths orbiting more than 150 nearby stars, or a scaled back interferometer capable of studying more than 30 stars. Finding evidence for life on just one of those planets would revolutionize our understanding of our place in the cosmos.
Author
Terrestrial Planets; Interferometry; NASA Programs; Formation Flying; Astrophysics; Earth Orbits; Interferometers

20080014688 California Inst. of Tech., Pasadena, CA USA
The Nearby Young Visual Binary HIP 115147 and Its Common Proper Motion Companion LSPM J2322 + 7847
Markov, V V; Zacharias, N; Hennessy, G S; Harris, H C; Monet, A K; Oct 20, 2007; 5 pp.; In English
Report No.(s): AD-A476251; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report a late M-type, common proper motion companion to a nearby young visual binary HIP 115147 (V368 Cep), separated by 963 arcsec from the primary K0 dwarf. This optically dim star was identified as a candidate high proper motion, nearby dwarf LSPM J2322 + 7847 by Lepine in 2005. The wide companion is one of the latest post-T Tauri low-mass stars found within 20 pc. We obtain a trigonometric parallax of 51.6 + or - 0.8 mas, in good agreement with the Hipparcos parallax of the primary star (50.7 + or - 0.6 mas). Our BVRI photometric data and near-infrared data from 2MASS are consistent with LSPM J2322 + 7847 being brighter by 1 mag in K sub s than field M dwarfs at V - K sub s = 6.66 , which indicates its pre-main-sequence status. We conclude that the most likely age of the primary HIP 115147 and its 11 arcsec companion HIP 115147B is 20-50 Myr. The primary appears to be older than its close analog PZ Tel (age 12-20 Myr) and members of the TWA association (7 Myr).
DTIC
Astrometry; Binary Stars; Dwarf Stars

20080014845 NASA Marshall Space Flight Center, Huntsville, AL, USA
Comparison of Ejecta Distributions from Normal Incident Hypervelocity Impact on Lunar Regolith Simulant
Edwards, David L.; Cooke, William; Scruggs, Rob; Moser, Danielle E.; January 07, 2008; 21 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 Jan. 2008, Reno, NV; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The National Aeronautics and Space Administration (NASA) is progressing toward long-term lunar habitation. Critical

to the design of a lunar habitat is an understanding of the lunar surface environment; of specific importance is the primary meteoroid and subsequent ejecta environment. The document, NASA SP-8013, was developed for the Apollo program and is the latest definition of the ejecta environment. There is concern that NASA SP-8013 may over-estimate the lunar ejecta environment. NASA's Meteoroid Environment Office (MEO) has initiated several tasks to improve the accuracy of our understanding of the lunar surface ejecta environment. This paper reports the results of experiments on projectile impact into powered pumice and unconsolidated JSC-1A Lunar Mare Regolith stimulant (JSC-1A) targets. The Ames Vertical Gun Range (AVGR) was used to accelerate projectiles to velocities in excess of 5 km/s and impact the targets at normal incidence. The ejected particles were detected by thin aluminum foil targets placed around the impact site and angular distributions were determined for ejecta. Comparison of ejecta angular distribution with previous works will be presented. A simplistic technique to characterize the ejected particles was formulated and improvements to this technique will be discussed for implementation in future tests.
Author
Regolith; Meteoroid Concentration; Hypervelocity Impact; Ejecta; Lunar Surface

20080015458 Academia Sinica, Shanghai, China
Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28
WAN, Ning-shan, Editor; Hu, Xiao-gong, Editor; ZHENG Wei-min, Editor; SHAO Zheng-yi, Editor; 2007; 297 pp.; In Chinese; See also 20080015459 - 20080015483; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Topics covered include: The Scientific Research and Technical Work of Shanghai Astronomical Observatory in 2006; Variation of the Night Sky Brightness at Zo - Se Station of Shanghai Astronomical Observatory; Determination of the Topology of the Neural Networks in the Prediction of LOD; Different Boundary Distribution between Indian and Australia Plates and Re-Discussion on Geodetic Formation of 2004 Sumatra-Andaman Ruptures by GPS Measurements; GloBal Sealevel Change from 1992 to 2007; Earth Orientation Parameter during 1998 - 2001 Solved with Lageos-1 Lageos-2 SLR Data; TerraSAR-X Satellite and Its Applications on Earth Science; Satellite Laser Ranging Observations at Shanghai Astronomical Observatory in 2006; Quintessence Black Hole Area Quantization; Search for Baryon Dark Matter in the Milky Way Galaxy with Microlensing Effects; Performance Study of the CCD Camera on the 1-m Reflector at NAOC; The Realization of the Frequency Locked Loop in Satellite Navigation Receivers; Research and Implement of On-Board Timer; An Implement of Playback Mark 5A Data for SHAO's Correlator; The Measurement of the Precision of Antenna's Surface with Holograph; A Relative Measurement Method Based on Phase Delay; Embedded Giga-bit Network System Used in VLBI Hardware Correlator Processor; The Application of Event Timer in Satellite Laser Ranging; The Atomic Frequency Standards Research at Shanghai Astronomical Observatory in 50 years; The Development of the Monitor System for the Miniature Hydrogen Atomic Clock; Hydrogen Absorbing Alloys Application in Hydrogen Maser; From CPT Clock to Optical Clock; Application of the Parallel 3D Fluid Dynamics Software Package NaSt3DGP; Data Preprocessing Method in VLBI Software Correlator System; and Software Design of High Precision Frequency Stability Testing System.
Derived from text
Black Holes (Astronomy); Satellite Laser Ranging; Hydrogen Masers; Global Positioning System; Astronomical Observatories; Frequency Stability; Earth Sciences; CCD Cameras; Milky Way Galaxy

20080015459 Shanghai Astronomical Observatory, China
Embedded Giga-bit Network System Used in VLBI Hardware Correlator Processor
LI, Jian; ZHANG, Xiu-zhong; XIANG, Ying; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 128-134; In English; See also 20080015458; Copyright; Avail.: Other Sources

As a radio astronomical observation technology with very high space resolution, Very Long Baseline Interferometry(VLBI) has been widely used in the high accuracy deep space probe tracking activities. The correlator is the key data-preprocessing device. With the rapid development of embedded system implemented on FPGA platform, FPGA and embedded system based hardware correlator become the highlight of the VLBI technology and have a dramatic progress. This paper studies the use of embedded Giga-bit Ethernet transmission system in the hardware correlator's long-term cumulative(LTA) processor subsystem improvement. Key words VLBI - correlator - embedded system - giga-bit ethernet - FPGA
Author
Radio Observation; Correlators; Field-Programmable Gate Arrays; Very Long Base Interferometry

20080015460 Shanghai Astronomical Observatory, China

The Application of Event Timer in Satellite Laser Ranging

WU, Zhi-bo; ZHANG, Zhong-ping; CHEN, Ju-pin; YANG, Fu-min; QIN, Si; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 135-141; In Chinese; See also 20080015458; Copyright; Avail.: Other Sources

The measuring rate of the traditional time-interval measurement methods is badly restricted by the time-interval and the event timing concept will resolve the problem perfectly. The event timer is a crucial equipment of high-repetition-rate SLR. This paper introduces the performance of A032-ET and how it is applied to SLR. The successful application will help to accomplish high-repetition-rate SLR.

Author

Satellite Laser Ranging; Time Measurement; Timing Devices; Rates (Per Time)

20080015461 Shanghai Astronomical Observatory, China

Hydrogen Absorbing Alloys Application in Hydrogen Maser

DAI, Jia-yu; LIN, Chuan-fu; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 160-165; In English; See also 20080015458; Copyright; Avail.: Other Sources

Hydrogen absorbing alloys have been widely used today to store the hydrogen, they also can be applied to the Hydrogen Maser. The paper describes the hydrogen storage principle of the La-Ni alloys and its application in the Hydrogen Maser of Shanghai Astronomical Observatory. To improve the reliability or reduce the possibility of leak, the structure of the hydrogen supplier has been improved. Since this hydrogen storage technology is initially applied in Shanghai Astronomical Observatory hydrogen Maser, further experiment is now being carried out. By contrast with other hydrogen supplier, the alloys hydrogen storage methods have the obvious advantage that the volume of alloys hydrogen storage container can be reduced and the pressure in the container can be decreased.

Author

Hydrogen Masers; Astronomical Observatories; Leakage; Reliability; Hydrogen

20080015462 Shanghai Astronomical Observatory, China

TerraSAR-X Satellite and Its Applications on Earth Science

CHEN, Yan-ling; HUANG, Cheng; FENG, Tian-hou; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 51-57; In English; See also 20080015458; Copyright; Avail.: Other Sources

TerraSAR-X is a new German little radar satellite that was just launched on Jun 15, 2007. The scheduled lifetime is 5 years. It carries a high frequency X-band SAR sensor that can be operated in different modes (resolutions) and polarization. TerraSAR-X will offer features that were not available from space geodesy before due to its high spatial resolution as high as 1 meter. This paper describes the advanced satellite systematically and completely. Firstly, the basic parameters, outer structure, imaging modes are illuminated in chapter 2. The sensor working in X-Band can operate in different operation modes, such as Spotlight, Stripmap, and ScanSAR mode, meanwhile it is able to provide interferometric radar data for the generation of DEM and deformation mapping. Secondly, the processing algorithms and products are listed in chapter 3. After the data is downlinked from the satellite, the DLR Payload Ground Segment for the TerraSAR-X then processes them step by step. The data processing includes pre-processing , CS (Chirp Scaling) imaging processing, radiometric and instrument phase calibration, multilook and ScanSAR beam stitching, and geocoding etc. , which are all seen in chapter 4. Frequently, DLR can issue complex, ortho-rectified and geocoded data for the users. Those SAR data can be used in many science fields including topographic mapping, geology, land resources and environment management, hydrology and oceanography, etc. Finally the future of this satellite is briefly introduced.

Author

Interferometry; Resources Management; Radar Data; Imaging Techniques; Indexes (Documentation); Earth Sciences; Environment Management; Land Management; Oceanography

20080015463 Shanghai Astronomical Observatory, China

Software Design of High Precision Frequency Stability Testing System

XIE, Yan; CAI, Yong; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 193-201; In English; See also 20080015458; Copyright; Avail.: Other Sources

Combined with the principle of testing system with high precision for frequency stability of atomic clocks, the design of software is introduced. Based on the demands of the software, the frame and the Row of automatic test and data processing

including its algorithm are analyzed in detail with OMT method. The software is proved by experimental results to be stable and automatic in testing process.
Author
Software Engineering; Atomic Clocks; Astronomy; High Frequencies; Frequency Stability; C++ (Programming Language)

20080015464 Shanghai Astronomical Observatory, China
Satellite Laser Ranging Observations at Shanghai Astronomical Observatory in 2006
Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 58-61; In English; See also 20080015458; Copyright; Avail.: Other Sources

This is a report on satellite laser ranging observations at Shanghai Astronomical Observatory in 2006. The total 1549 passes and 7481117 observations for 19 satellites are obtained. The paper also presents partial subsystem improvements.
Author
Astronomical Observatories; Satellite Instruments; Satellite Laser Ranging

20080015465 Shanghai Astronomical Observatory, China
The Scientific Research and Technical Work of Shanghai Astronomical Observatory in 2006
HONG, Xiao-yu; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 9-16; In English; See also 20080015458; Copyright; Avail.: Other Sources

In this paper, the scientific research, international cooperation, human resource and education, administration, companies, civilization development and so on of Shanghai Astronomical Observatory in 2006 is briefly reviewed.
Author
Astronomical Observatories; International Cooperation; Education; Research Facilities

20080015466 Shanghai Astronomical Observatory, China
Variation of the Night Sky Brightness at Zo - Se Station of Shanghai Astronomical Observatory
YAO, Bao-an; MAO, Ya-qing; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 17-22; In English; See also 20080015458; Copyright; Avail.: Other Sources

Using the CCD data obtained at the 1.56m reflector at the Zo-Se station of Shanghai Astronomical Observatory from 1994 till 2007, the variation of the night sky brightness at the Zo-Se station has been measured. Due to the development of the large city-Shanghai, the night sky brightness in V has increased from about 19 mag per square arcsec to about 15.8 mag per square arcsec, i. e. the night sky has brightened up for about 20 times since 1994. Now it is difficult to do accurate photometry for stars fainter than V = 14 mag using the 1.56m reflector.
Author
Charge Coupled Devices; Astronomical Photometry; Astronomical Observatories; CCD Cameras; Sky Brightness; Night Sky; Reflectors

20080015467 Shanghai Astronomical Observatory, China
The Measurement of the Precision of Antenna's Surface with Holograph
WANG, Jin-qing; YU, Hong; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 109-118; In English; See also 20080015458; Copyright; Avail.: Other Sources

This paper describes the basic theory and method of holography which is used to measure the accuracy of the antennas surface. It is significant and popular to all radio telescopes, satellite and big antenna arrays. After the review of the basic math theory of holography, the control system, of the antenna for the holographic measurement is introduced in detail. At last the method of data processing is also dissertated and the output graphs also be given some conclusion.
Author
Antenna Arrays; Holography; Radio Telescopes; Satellite Antennas; Fourier Transformation; Precision

20080015468 Shanghai Astronomical Observatory, China
A Relative Measurement Method Based on Phase Delay
WANG, Jin-qing; WEI, Wen-ren; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 119-127; In English; See also 20080015458; Copyright; Avail.: Other Sources

In this paper, the measurement of the cable delay that is within VLBI system's Ground Unit is described in detail. This measurement method gives out a useful reference in related fields of measurement. The theory of cable measurement, reflect

modulation and phase comparator are introduced in the circuit theory section. The three parts are deduced and analyzed in mathematics. A sample of the relative cable delay's variation versus temperature is given out at last.
Author
Phase Shift; Very Long Base Interferometry; Measurement; Modulation; Comparators; Circuits

20080015469 Shanghai Astronomical Observatory, China
An Implement of Playback Mark 5A Data for SHAO's Correlator
Wang, Wei-hua; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 103-108; In English; See also 20080015458; Copyright; Avail.: Other Sources

m2hc is a subsystem of the correlator of Shanghai Astronomical Observatory. The package is used to play back VLBI raw data from Mark 5 to the correlator. It works well in VLBI observations of Chang ' e lunar project. We will provide the design, implement of the package m2hc. and the application result of data processing.
Derived from text
Very Long Base Interferometry; Astronomical Observatories; Correlators; Playbacks; Data Processing

20080015470 Shanghai Astronomical Observatory, China
Earth Orientation Parameter during 1998 - 2001 Solved with Lageos-1 Lageos-2 SLR Data
ZHU, Yuan-lan; ZHANG, Fei-peng; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 42-50; In English; See also 20080015458; Copyright; Avail.: Other Sources

Using Shanghai Astronomical Observatory COMPASS software, we solve the Earth Orientation Parameter (EOP) using the Lageos Satellite Laser Range (SLR) data from 1998 to 2001. The results are compared with EOP(IERS) C04 during the same period. The EOP(C0MPASS) shows the consistency of X(sub p) -0.32mas, Y(sub p) -4.34mas for the polar motion and D(sub r) -0.025ms for the length-of-day (LOD) variation.
Author
Earth Orientation; Astronomical Observatories; Satellite Instruments; Earth Rotation; Lageos (Satellite); Polar Wandering (Geology); Consistency

20080015471 Shanghai Astronomical Observatory, China
Quintessence Black Hole Area Quantization
SUN, Zu-yao; SHEN, You-gen; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 62-65; In English; See also 20080015458; Copyright; Avail.: Other Sources

Recent observations have shown that dark energy exists in the universe. Thus, it is necessary to study the black hole thermodynamics in the case of dark energy. In this paper, the horizons of a black hole which is surrounded by quintessence are quantized by the reduced phase space quantization. The discrete spectrum is obtained.
Author
Black Holes (Astronomy); Dark Energy; Measurement; Thermodynamics; Horizon; Spectra

20080015472 Shanghai Astronomical Observatory, China
Different Boundary Distribution between Indian and Australia Plates and Re-Discussion on Geodetic Formation of 2004 Sumatra-Andaman Ruptures by GPS Measurements
YANG, Zhi-gen; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 30-36; In English; See also 20080015458; Copyright; Avail.: Other Sources

With reference to the former discussion on geodetic evidences of formation of the Sumatra-Andaman main-shock and ruptures occurred on 26 December 2004, we further estimate the convergence rates between Indian and Burma/SE Eurasian plates along the Sumatra-Nicobar rupture zone based on the boundary distribution mode between Indian and Australia plates with a tendency of SW (approx.equals S5deg) approx. NE (approx. equals N2deg), which was used as a reference by many authors in the previous discussions on the 2004 earthquake event. Comparison is made between the estimated rates mentioned above and the corresponding rates between Australian and Burma/SE Eurasian plates based on boundary distributions of the Indian and Australian plates in NUVEL-1A plate motion model. The possible geodetic mechanism for the 20% Sumatra-Andaman earthquake is confirmed. It is found that the Burma micro-plate would be inadequate to be used to estimate convergence rate between Indian and Burma/SE Eurasian plates because the present parameters of the Burma plate are not

expected to be accurate. The relative motion between Indian and Australia plates with (20.8+/-25.3) mm/a would potentially play a key role on the interpolate orogens formation.
Author
Geodesy; Boundaries; Burma; Tectonics; Earthquakes; Convergence; Australia; India; Global Positioning System

20080015473 Shanghai Astronomical Observatory, China
Research and Implement of On-Board Timer
FAN, Ying; ZHAO, Yun; HUANG, Pei-cheng; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 96-102; In English; See also 20080015458; Copyright; Avail.: Other Sources

Given the ability to survive in space, including anti-radiation , anti-latchup , anti-upset , electro-vacuum and wide range of working temperature, on-board timer must also guarantee the measuring precision. After presenting common methods of time interval measurement, this article gives out the principle of on-board timer and then details the working environment in space, including space radiation, vacuum and thermal radiation. Corresponding strategy is listed at last. Key words on-board timer - anti-radiation - anti-thermal radiation - vacuum adaptability
Author
Time Measurement; Timing Devices; Extraterrestrial Radiation; Radiation Protection; Vacuum; Thermal Radiation

20080015474 Shanghai Fisheries University, Shanghai, China
Introduction and Application of the Parallel 3D Fluid Dynamics Software Package NaSt3DGP
CHANG, Ying-li; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 172-184; In English; See also 20080015458; Copyright; Avail.: Other Sources

NaSt3DGP is a parallel software package to solve the 3D incompressible fluid dynamic problems in Cartesian coordinates by using Finite Difference Method. This paper described the software's principles of domain-decomposition policy, finite difference scheme and flow chart in detail. It's reliability and precision are tested by our applications and the efficiency is appraised.
Author
Applications Programs (Computers); Fluid Dynamics; Incompressible Fluids; Reliability; Cartesian Coordinates; Finite Difference Theory

20080015476 Shanghai Astronomical Observatory, China
From CPT Clock to Optical Clock
Qiu, Shi; Zhang, Jun-hai; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 166-171; In English; See also 20080015458; Copyright; Avail.: Other Sources

This paper describes the basic principle and the research progresses of the CPT (Coherent Population Trapping) atomic frequency standard and the light frequency standard. The physics package of Rb maser (CPT, passive) can be controlled in the 100 cu cm, lower 1 W consumptions and the stability is 4 x 10(exp -11) tau(exp -1/2). To Cs maser, CPT, the physics package is only about 1 cu cm, the consumption is lower than 30 mW, the stability is better than 6 x 10(exp -10) tau(exp -1/2). It is the minimum atomic clock with lowest consumption in the world currently. As the development of technology, the comb generator of femto-second laser combs has been integrated on the optics stage of 1.2 x 1.0 sq m. Since combining the femto-second laser combs with optics measure method, the light clock is set up. Its stability can raise 10(exp -16) to 10(exp -18) or 10(exp -22), it will become the most precise time instrument at present.
Author
Atomic Clocks; Frequency Standards; Integrated Optics; Trapping; Lasers; Masers

20080015477 Shanghai Astronomical Observatory, China
The Atomic Frequency Standards Research at Shanghai Astronomical Observatory in 50 years
ZHAI, Zao-cheng; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 142-150; In English; See also 20080015458; Copyright; Avail.: Other Sources

Shanghai Astronomical Observatory has developed atomic frequency standards since 1958. Ammonia maser and various kinds of hydrogen atomic clocks have been developed successfully. And the active hydrogen atomic clocks have been realized commercial productions. So far, more than 60 active hydrogen atomic clocks have been built in Shanghai Astronomical Observatory, and they have been used widely in the Science-Tech fields. This paper introduces briefly SHAO's atomic

frequency standards developments, the improvements of their performance specification and their applications. The developing future of atomic clocks in SHAO is also pointed out briefly.
Author
Astronomical Observatories; Atomic Clocks; Frequency Standards; Hydrogen; Gas Masers; Ammonia

20080015478 Shanghai Astronomical Observatory, China
The Development of the Monitor System for the Miniature Hydrogen Atomic Clock
CHEN, Cong-jun; LIN, Chuan-fu; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 151-159; In English; See also 20080015458; Copyright; Avail.: Other Sources

This paper mainly introduces the monitor system for the miniature hydrogen clock, which is being developed in Shanghai Astronomical Observatory at present. This system realizes the functions as follows : monitoring and controlling working conditions of the clock, automatic start-up and shut - down, automatic parameter inspecting and alarming, controlling and modifying the frequency of synthesizer and the temperature of the microwave cavity and the hydrogen beam flux.
Author
Astronomical Observatories; Atomic Clocks; Frequency Synthesizers; Microwaves; Miniaturization; Hydrogen

20080015479 Shanghai Astronomical Observatory, China; University of Science and Technology, China
Search for Baryon Dark Matter in the Milky Way Galaxy with Microlensing Effects
Fu, Jian; YANG, Xiao-feng; Yan, Zhen; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 66-79; In English; See also 20080015458; Copyright; Avail.: Other Sources

In this article, we summarized the principles, observation methods and results of searching baryon dark matter in the Milky Way with microlensing effects, and meanwhile we also introduce some present work and progress of some groups in the world. Firstly, the understanding of baryon dark matter 1s reviewed, and the dark celestial body in our galaxy is called massive astrophysical compact halo object (MACHO). Secondly, some basic conceptions and equations about microlensing are summarized. The difference among strong lensing, weak lensing and microlensing is discussed. The definitions and expressions of optical depth and time scale of light variance are also listed, which are two important parameters of microlensing. Then, some methods of searching MACHOs and some observation effects are elaborated. And finally, we summarized some present work done by MACHO group, EROS group etc. MACHO group get the result that MACHOs are important composition of the Milky Way halo. They consider about 20% of the mass of the Milky Way halo are MACHOS. While EROS group get the upper limit is only about 7%. So conflict exists between the results of the two groups.
Author
Baryons; Dark Matter; Milky Way Galaxy; Matter (Physics); Optical Thickness; Massive Compact Halo Objects; Celestial Bodies; Astrophysics

20080015480 Shanghai Astronomical Observatory, China
Data Preprocessing Method in VLBI Software Correlator System
ZHANG, Dong; ZHENG, Wei-min; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 185-192; In English; See also 20080015458; Copyright; Avail.: Other Sources

In the VLBI software correlator system of the Chinese lunar exploration project, the original data from the VLBI stations must be preprocessed before correlation. For this reason, a data preprocessing program was developed. This module first received the data from the MARK 5 terminals at the observatories, and finished the functions of data decoding, error correcting, data dividing, then changed them into a batch of standard Linux files of one minute length and saved them on the disk array for software correlation and fringe searching finally. Cooperating with this preprocessing module, the software correlator system was able to meet the requirements of the real time and the post working modes.
Author
Data Processing Terminals; Very Long Base Interferometry; Correlators; Decoding; Time Synchronization; Real Time Operation; Preprocessing; Lunar Exploration

20080015481 Shanghai Astronomical Observatory, China
Determination of the Topology of the Neural Networks in the Prediction of LOD
WANG, Qi-jie; LIAO, De-chun; ZHOU, Yong-hong; LIAO, Xin-hao; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 23-29; In English; See also 20080015458; Copyright; Avail.: Other Sources

The prediction of the Length of Day (LOD) is of great scientific and practical importance. This study employs the

non-linear artificial neural networks (BP network, i. e. Back-Propagation network) to predict the LOD change. The predicting ability of the BP network is determined by the topology of the network. Different topologies are needed to solve different problems. This study analyzes the algorithms of topology determinations, and chooses the least Root Mean Squared Error (RMSE) as a criterion to determine the topology of the network. Finally, this paper applied the developed method to predict the LOD change. The results show that this method is reliable and effective.
Author
Mean Square Values; Predictions; Neural Nets; Topology; Errors; Algorithms

20080015482 Shanghai Astronomical Observatory, China
The Realization of the Frequency Locked Loop in Satellite Navigation Receivers
CAI, Fan; DU, Yan; Huang, Pei-cheng; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 89-95; In English; See also 20080015458; Copyright; Avail.: Other Sources

This paper researches on frequency locked loop in satellite navigation receivers in detail and mainly involves to the algorithm of the discriminator in frequency locked loop and the realization. The simulation of the realization on frequency locked loop is done.
Author
Frequency Discriminators; Navigation; Receivers

20080015483 Shanghai Astronomical Observatory, China
Performance Study of the CCD Camera on the 1-m Reflector at NAOC
YAO, Baoan; WANG, Shube; TANG, Zhenghong; Annals of Shanghai Astronomical Observatory, Academia Sinica, Volume 28; 2007, pp. 80-88; In English; See also 20080015458; Copyright; Avail.: Other Sources

A performance study of the new VersArray 1340 x 1300B CCD camera attached to the 1-m reflector at Xinglong Observatory, National Astronomical Observatories (NAOC) is presented. The camera has a good bias with very weak pattern, low readout noise and low dark. The linearity appears to be very good on the transfer curve when the dome flat field exposures are used to check nt. However, both in dome flat field (extended light source) exposures and in real star (point light source) observations, blooming occurs in the flat frames or inside bright star images when the pixel value is higher than about 55000 adu (at a gain of 3.7 e/adu), so the very bright star images should be avoided in constructing the point spread function. But the aperture photometry of bright point sources (stars) may be still feasible due to the principle of charge conservation. In addition, the shutter function of the camera is also determined.
Author
Astronomical Observatories; CCD Cameras; Point Sources; Reflectors; Photometry; Light Sources

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080014249 Florida Univ., Gainesville, FL, USA
Terrestrial Planet Finder Coronagraph and Enabling Technologies
Ford, Virginia G.; January 7, 2005; 23 pp.; In English; Colloquium, University of Florida, 7 Jan. 2005, Gainesville, FL, USA; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40662

Starlight suppression research is Stowed in Delta IV-H advancing rapidly to approach the required contrast ratio. The current analysis of the TPF Coronagraph system indicates that it is feasible to achieve the stability required by using developing technologies: a) Wave Front Sensing and Control (DMs, control algorithms, and sensing); b) Laser metrology. Yet needed: a) Property data measured with great precision in the required environments; b) Modeling tools that are verified with testbeds.
Derived from text
Terrestrial Planets; Coronagraphs; Algorithms; Lasers; Extrasolar Planets; Planet Detection

20080014401 Exeter Univ., UK

Optical Interferometric Observations of Theta1 Orionis C from NPOI and Implications for the System Orbit (Preprint)

Patience, J; Zavala, R T; Prato, L; Franz, O; Wasserman, L; Tycner, C; Hutter, D J; Hummel, C A; Jan 2007; 14 pp.; In English
Report No.(s): AD-A475722; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA475722

With the Navy Prototype Optical Interferometer (NPOI), the binary system Theta 1 Orionis C, the most massive member of the Trapezium, was spatially resolved over a time period extending from February 2006 to March 2007. The data show significant orbital motion over the 14 months, and, after combining the NPOI data with previous measurements of the system from the literature, the observations span 10 years of the orbit. Our results indicate that the secondary did not experience an unusually close periastron passage this year, in contradiction to the prediction of a recently published, highly eccentric 11 year orbit. Future observations of this source will be required to improve the orbital solution. Possible implications of the results in terms of system distance are discussed, although a main conclusion of this work is that a definitive orbit solution will require more time to obtain suficient phase coverage, and that the interaction effects expected at periastron did not occur in 2007.
DTIC

Binary Stars; Interferometers; Interferometry; Optical Measurement; Orbits; Orion Constellation; Visual Observation

20080014685 Montana State Univ., Bozeman, MT USA

Space Vehicle Material and Plume Interactions With the Low Earth Orbital Environment

Minton, Timothy K; Jan 15, 2008; 20 pp.; In English
Contract(s)/Grant(s): AFOSR-FA9550-04-1-0428
Report No.(s): AD-A476240; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The setup of a UHV apparatus with a hyperthermal 0-atom source was completed, and this apparatus is available as infrastructure for in-situ investigations of surfaces modified by hyperthermal atomic-oxygen. The laser-breakdown, hyperthermal atomic-oxygen source has been dramatically improved by the redesigned molecular beam valve. A quartz crystal microbalance has been used to study the erosion kinetics of a number of P0SS-containing and Al203-coated polyimides during exposure to hyperthermal 0 atoms. Crossed-beams experiments in the PI's lab and corresponding theoretical studies by collaborators have revealed the dynamics of 0(3P) reactions with several small molecules that might be found in rocket exhaust gases. Beam-surface scattering experiments, in which hyperthermal 0 and Ar atoms were directed at fluoropolymer surfaces (with and without the presence of VUV light), found synergistic effects involving 0-atom reactions, VUV light, and collision-induced dissociation that may dominate the mechanism of Teflon degradation in low Earth orbit. The dynamics of hyperthermal Ar scattering from graphite showed the risk of using simple models to interpret hyperthermal gas-surface interactions. The exposure of numerous samples to a beam of hyperthermal oxygen atoms confirmed the 0-atom resistance of several new POSS polymers and deepened our understanding of the erosion mechanisms of polymers. The infrastructure to study hyperthermal interactions has been transitioned to a Center for Laboratory Studies of Rocket Plume Chemistry and to the support of two STTR projects aimed at the development of improved coatings for use in space.
DTIC

Aerospace Environments; Earth Orbital Environments; Exhaust Gases; Plumes

20080015543 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Ares V: Application to Solar System Scientific Exploration

Reh, Kim; Spilker, Tom; Elliott, John; Balint, Tibor; Donahue, Ben; McCormick, Dave; Smith, David B.; Tandon, Sunil; Woodcock, Gordon; January 2008; 12 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40727

The following sections describe Ares V performance and its payoff to a wide array of potential solar system exploration missions. Application to potential Astrophysics missions is addressed in Reference 3.
Author

Ares 5 Cargo Launch Vehicle; Launching; Astrophysics

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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*.

20080014248 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Radiator Development for Oxygen Storage on the Moon
Chui, Talso; Zhang, Burt; Zhong, Fang; Barmatz, Martin; February 8, 2006; 12 pp.; In English; Habitation, 5-8 Feb. 2006, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40670

Vision for Exploration includes 'use of lunar resources to support sustained human space exploration'. In a favorable orbit, dark sky could be a valuable resource. Spitzer Space Telescope dewar shell maintained at 35 K. Lunar orbit is favorable. Design of radiator to specific lunar environment. A large patch of lunar sky is permanently dark. Radiator provides reliable and un-interrupted cooling. Applications include: a) Zero-boil-off cryogen storage; b) Separation of lunar volatiles for resource utilization; c) Purify oxygen for astronauts; and d) Scrub air for habitation.
Author
Lunar Environment; Lunar Orbits; Cryogenics; Cooling; Evaporation; Cryogenic Equipment; Oxygen

20080014318 NASA Johnson Space Center, Houston, TX, USA
The Chronology of Asteroid Accretion, Differentiation, and Secondary Mineralization
Nyquist, L. E.; Kleine, T.; Shih, C.-Y.; Reese, Y. D.; [2008]; 49 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 811073.02.02.01.04; RTOP 344-31; Copyright; Avail.: CASI: A03, Hardcopy

We evaluate initial (Al-26/Al-27)(sub I), (Mn-53/Mn-55)(sub I), (Hf-182/Hf-180)(sub I), and Pb-207/Pb-206 ages for igneous differentiated meteorites and chondrules from ordinary chondrites for consistency with radioactive decay of the parent nuclides within a common, closed isotopic system, i.e., the early solar nebula. We find that the relative abundances of Al-26, Mn-53, and Hf-182, here denoted by I(Al)(sub CAI, I(Mn)(sub CAI) and I(Hf)(sub CAI), are consistent with decay from common initial values for the bulk solar system. I(Mn)(sub CAI) and I(Hf)(sub CAI) = 9.1+/-1.7 x 10(exp -6) and 1.06+/-0.09 x 10(exp -6) respectively, correspond to the canonical value of I(Al)(sub CAI) = 5.1 x 10(exp -5). I(Hf)(sub CAI) thus determined is consistent with I(Hf)(sub CAI) = 1.003+/-0.045 x 10(exp -6) directly determined in separate work. I(Mn)(sub CAI) is within error of the lowest value directly determined for CAI. We suggest that erratically higher values directly determined for CAI in carbonaceous chondrites reflect proton irradiation of unaccreted CAIs by the early Sun after other asteroids destined for melting by Al-26 decay had already accreted. The Mn-53 incorporated within such asteroids would have been shielded from further 'local' spallogenic contributions. The relative abundances of the short-lived nuclides are less consistent with the Pb-207/Pb-206 ages of the corresponding materials with the best consistency being obtained between (Hf-182/Hf-180)(sub I) and Pb-207/Pb-206 ages of angrites. (Hf-182/Hf-180)(sub I) decreases with decreasing Pb-207/Pb-206 ages at the rate expected from the 8.90+/-0.09 Ma half-life of Hf-182. However, the model 'CAI age' thus determined, T(sub CAI,Mn-W) = 4568.6+/-0.7 Ma, is older than the commonly accepted directly measured value T(sub CAI) = 4567.l+/-0.2 Ma. I(Al)(sub I), and (Mn-53/Mn-55)(sub I) are less consistent with Pb-207/Pb-206 ages, but determine T(sub CAI, Mn-Cr) = 4568.3+/-0.5 Ma relative to I(AI)(sub CAI)= 5.1 x 10(exp -5) and a Pb-207/Pb-206 age of 4558.6 Ma for the LEW86010 angrite. However. the (Mn-53/Mn-55)(sub I) and Pb-207/Pb-206 ages of 'intermediate' age D'Orbigny-clan angrites and Asuka 881394 are inconsistent with radioactive decay from CAI values with a Mn-55 half-life of 3.7+/-0.4 Ma. in spite of consistency between (Mn-53/Mn-55)(sub I) and (Al-26/Al-27)(sub I). Nevertheless, it appears that the Mn-Cr method with I(Mn)(sub CAI) = 9.1+/-1.7 x 10(exp -6) can be used to date primary igneous events and also secondary mineralization on asteroid parent bodies. We summarize ages thus determined for igneous events on differentiated asteroids and for carbonate and fayalite formation on carbonaceous asteroids.
Author
Asteroids; Chronology; Aluminum Isotopes; Hafnium Isotopes; Manganese Isotopes; Carbonaceous Chondrites; Meteorites

20080015377 Curtin Univ. of Technology, Perth, Australia; NASA Johnson Space Center, Houston, TX, USA
History of the Moon Recorded by the Oldest Zircon Grain
Nemchin, A.; Timms, N.; Pidgeon, R.; Geisler, T.; Meyer, C.; January 2008; 20 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DP0664078; Copyright; Avail.: CASI: A03, Hardcopy

The first ca 700 Myr of lunar history was dominated by two major processes (i) crystallisation of the Lunar Magma Ocean

(LMO) and (ii) an intense meteorite bombardment between ca 3.85 - 3.90 Ga, referred to as lunar cataclysm (Ref.1). However, controversy exists over the precise timing of LMO2. The lunar 15 cataclysm has also been challenged because the defining isotopic ages could 16 represent resetting during the latest impact events and mask more even and exponentially decaying flux of older impacts. Here we report the discovery of a 4417 plus or minus 6 Myr old zircon in lunar breccia sample 72215,195. This is the oldest zircon found on the Moon and is older that the oldest zircon reported on Earth. This zircon has survived at least two major shock events, including the Serenitatis impact, but preserves its primary age. This age provides a younger limit for the crystallisation of LMO. In addition, this zircon grain preserves evidence of a shock related isotopic disturbance at 4333 plus or minus 7 Ga, which together with other records of meteorite impacts older than 3.90 Ga (Ref.6), significantly extends the duration of lunar meteoritic bombardment beyond the proposed ca 3.85 - 3.90 Ga lunar cataclysm.
Author
Moon; Lunar Surface; Histories; Zirconium Oxides; Granular Materials; Lunar Rocks; Lunar Geology

20080015501 Georgia Inst. of Tech., Atlanta, GA, USA; NASA Langley Research Center, Hampton, VA, USA
Design of the ARES Mars Airplane and Mission Architecture
Braun, Robert D.; Wright, Henry S.; Croom, Mark A.; Levine, Joel S.; Spencer, David A.; [2006]; 22 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Significant technology advances have enabled planetary aircraft to be considered as viable science platforms. Such systems fill a unique planetary science measurement gap, that of regional-scale, near-surface observation, while providing a fresh perspective for potential discovery. Recent efforts have produced mature mission and flight system concepts, ready for flight project implementation. This paper summarizes the development of a Mars airplane mission architecture that balances science, implementation risk and cost. Airplane mission performance, flight system design and technology maturation are described. The design, analysis and testing completed demonstrates the readiness of this science platform for use in a Mars flight project.
Author
Planetary Aerial Vehicles; Ares 1 Launch Vehicle; Space Missions; Mars (Planet); Systems Engineering; Aircraft Design

20080015523 NASA Marshall Space Flight Center, Huntsville, AL, USA
Lunar Dust Simulant in Mechanical Component Testing - Paradigm and Practicality
Jett, T.; Street, K.; Abel, P.; Richmond, R.; February 10, 2008; 37 pp.; In English; STAIF 2008 Institute for Space and Nuclear Power Studies University of New Mexico, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015523

Due to the uniquely harsh lunar surface environment, terrestrial test activities may not adequately represent abrasive wear by lunar dust likely to be experienced in mechanical systems used in lunar exploration. Testing to identify potential moving mechanism problems has recently begun within the NASA Engineering and Safety Center Mechanical Systems Lunar Dust Assessment activity in coordination with the Exploration Technology and Development Program Dust Management Project, and these complimentary efforts will be described. Specific concerns about differences between simulant and lunar dust, and procedures for mechanical component testing with lunar simulant will be considered. In preparing for long term operations within a dusty lunar environment, the three fundamental approaches to keeping mechanical equipment functioning are dust avoidance, dust removal, and dust tolerance, with some combination of the three likely to be found in most engineering designs. Methods to exclude dust from contact with mechanical components would constitute mitigation by dust avoidance, so testing seals for dust exclusion efficacy as a function of particle size provides useful information for mechanism design. Dust of particle size less than a micron is not well documented for impact on lunar mechanical components. Therefore, creating a standardized lunar dust simulant in the particulate size range of ca. 0.1 to 1.0 micrometer is useful for testing effects on mechanical components such as bearings, gears, seals, bushings, and other moving mechanical assemblies. Approaching actual wear testing of mechanical components, it is beneficial to first establish relative wear rates caused by dust on commonly used mechanical component materials. The wear mode due to dust within mechanical components, such as abrasion caused by dust in grease(s), needs to be considered, as well as the effects of vacuum, lunar thermal cycle, and electrostatics on wear rate.
Author
Lunar Dust; Environmental Tests; Performance Tests; Lunar Exploration; Lunar Surface; Size Distribution; Particulates; Abrasion

20080015540 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Express: The Exploration of Phobos
Duxbury, Thomas C.; Chicarro, A.; Neukum, G.; Bibring, J. -P.; Formasano, V.; Picardi, G.; Plaut, J.; Barabash, S.; Berteau, J. -L.; Paetzold, M.; Hoffman, H.; July 20, 2004; 6 pp.; In English; 35th COSPAAR Scientific Assembly, 18-25 July 2004, Paris, France; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40730

The origin, structure and composition of Phobos are essentially still unresolved issue, with major outcomes for understanding the origin and evolution of the Solar system, and of the Mars system. Several missions have been designed with this unique body the only target. Is Phobos a captured small body (and in this case, can we identify the degree of differentiation such a small object has undergone ?), or is there any co-generic process with Mars involved ? Are there still volatile species trapped, and if so where, and in what form ? What are the reciprocal contributions of Mars and Phobos material accreted in the other body? The number of key clues for deciphering the early solar system processes, the Mars-Phobos binary evolution, and the role Phobos could play in the future of Mars exploration (including human expeditions), are numerous, and exciting for a large community. Part of the answers are in the high resolution coverage of this object (optical and IR, for composition variation), and in its full spectral analysis, from UV to thermal IR : Mars Express is the unique mission to provide this opportunity, and orbit 756, August 22, a totally unique opportunity to approach Phobos so closely. OMEGA should provide all across Stickney, the deepest accessible material, and over more than 20 km along, a spatial resolution less than 200 m, and assess the composition (and possibly their variations) wrt silicates (mafic materials), oxides, and eventually hydrated minerals and organics. By no means we should miss this opportunity: no one would understand the rationale not to turn the instruments ON while so close, and pointing them towards the Phobos surface.
Author
Mars Exploration; Phobos; Mars Express; Spectrum Analysis; Silicates; Mineralogy

20080015541 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Assessment of Alternative Europa Mission Architectures
Langmaier, Jerry; Elliott, John; Clark, Karla; Pappalardo, Robert; Reh, Kim; Spilker, Tom; January 2008; 25 pp.; In English; Original contains color illustrations
Report No.(s): JPL 08-1; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40725

The purpose of this study was to assess the science merit, technical risk and qualitative assessment of relative cost of alternative architectural implementations as applied to a first dedicated mission to Europa. The objective was accomplished through an examination of mission concepts resulting from previous and ongoing studies. Key architectural elements that were considered include moon orbiters, flybys (single flybys like New Horizons and multiple flybys similar to the ongoing Jupiter System Observer study), sample return and in situ landers and penetrators.
Author
Sample Return Missions; Mission Planning; Europa; Costs; Assessments; Risk

20080015570 NASA Marshall Space Flight Center, Huntsville, AL, USA
Risk-Assessment for Equipment Operating on the Lunar Surface
Richmond, R. C.; Kusiak, A.; Ramachandran, N.; February 10, 2008; 10 pp.; In English; STAIF 2008: Institute for Space and Nuclear Power Studies, University of New Mexico, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

Particle-size distribution of lunar dust simulant is evaluated using scanning electron spectroscopy in order to consider approaches to evaluating risk to individual mechanical components operating on the lunar surface. Assessing component risk and risk-mitigation during actual operations will require noninvasive continuous data gathering on numerous parameters. Those data sets would best be evaluated using data-mining algorithms to assess risk, and recovery from risk, of individual mechanical components in real-time.
Author
Real Time Operation; Lunar Dust; Risk Assessment; Particle Size Distribution; Lunar Surface

20080015645 NASA Marshall Space Flight Center, Huntsville, AL, USA
Development of the Lunar Environments Test System (LETS)
Vaughn, Jason A.; Schneider, Todd A.; February 10, 2008; 1 pp.; In English; Space Technology and Applications International Forum, STAIF-2008, 10-14 Feb. 2008, Albuquerque, NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

The lunar surface is an inhospitable environment to work in to say the least. The environment on the lunar surface is

defined by intense ultraviolet radiation, solar wind radiation (primarily electrons and protons), electrically charged dust layers, and temperatures as low as -200 C. As NASA makes plans to send manned missions to the moon's surface, significant preparation must be undertaken to ensure that the materials and mechanical components used on those missions can survive in the harsh environment. The work presented will detail the development of the Lunar Environment Test System (LETS) at the Marshall Space Flight Center that will allow scientists and engineers the ability to test new materials, mechanical components, and proposed mission hardware in a representative lunar surface environment. The LETS encompasses all the environments of the lunar surface including vacuum, thermal extremes, vacuum ultraviolet radiation, and protons and electrons from the solar wind.

Author

Lunar Environment; Environmental Tests; Ultraviolet Radiation; Solar Wind; Thermal Radiation; Far Ultraviolet Radiation; Protons; Electrons; Lunar Surface

20080015650 NASA Marshall Space Flight Center, Huntsville, AL, USA

Molten Materials Transfer and Handling on the Lunar Surface

Stefanescu, Doru M.; Curreri, Peter A.; Sen, Subhayu; February 10, 2008; 1 pp.; In English; Space Technology and Applications International Forum (STAIF), 10-14 Feb. 2008, Albuquerque, Mexico; Copyright; Avail.: Other Sources;

Abstract Only

Electrolytic reduction processes as a means to provide pure elements for lunar resource utilization have many advantages. Such processes have. the potential of removing all the oxygen from the lunar soil for use in life support and for propellant. Electrochemical reduction also provides a direct path for the. production of pure metals and silicon which can be utilized for in situ manufacturing and power production. Some of the challenges encountered in the electrolytic reduction processes include the feeding of the electrolytic cell (the transfer of electrolyte containing lunar soil), the withdrawal of reactants and refined products such as the liquidiron~siliconalloy with a number of impurities, and the spent regolith slag, produced in the hot electrolytic cell for the reduction of lunar regolith. The paper will discuss some of the possible solutions to the challenges of handling molten materials on the lunar surface, as well as the path toward the construction and testing of a proof-of-concept facility.

Author

Lunar Surface; Materials Handling; Electrolytic Cells; Silicon; Lunar Soil; Impurities; Life Support Systems; Oxygen

20080015653 NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA Marshall Impact Testing Facility Capabilities Applicable to Lunar Dust Work

Evans, Steven W.; Finchum, Andy; Hubbs, Whitney; Eskridge, Richard; Martin, Jim; February 10, 2008; 5 pp.; In English; Institute for Space and Nuclear Power Studies, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015653

The Impact Testing Facility at Marshall Space Flight Center has several guns that would be of use in studying impact phenomena with respect to lunar dust. These include both ballistic guns, using compressed gas and powder charges, and hypervelocity guns, either light gas guns or an exploding wire gun. In addition, a plasma drag accelerator expected to reach 20 km/s for small particles is under development. Velocity determination and impact event recording are done using ultra-high-speed cameras. Simulation analysis is also available using the SPHC hydrocode.

Author

Hypervelocity Impact; Impact Tests; Lunar Dust; Hypervelocity Guns; Compressed Gas; Light Gas Guns; Test Facilities; Plasma Accelerators

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20080014315 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Excitation and Charge Exchange Phenomena in Astronomical Objects: Measurement of Cross Sections and Lifetimes
Chutjian, Ara; Smith, S.; Lozano, J.; Cadez, I.; Greewnood, J.; Mawhovter, R.; Williams, I.; Niimura, M.; January 16, 2003; 11 pp.; In English; The Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP) Topical Group on EUV and X-Ray Emission from Comets, Planets, and Heliospheric Gas, Cambridge, Massachuset, 16-17 Jan. 2003, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40702

This document addresses extreme ultraviolet radiation and X-ray emissions from comets, planets and heliospheric gases focusing on the measurement of charge-exchange cross sections and radiative lifetimes. Highly-charged heavy ions present in the solar wind, and their abundance relative to the total oxygen-ion abundance are detailed. The plan for the Jet Propulsion Laboratory high-charge ion facility is outlined detailing its ability to measure absolute collisional excitation cross sections, absolute charge-exchange cross sections, lifetimes of metastable ion levels, and X-ray emission spectra following charge changes.
Author
Excitation; Charge Exchange; Radiative Lifetime; Extreme Ultraviolet Radiation; Ion Emission; Heavy Ions; Emission Spectra

20080015565 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Review of Radiolysis Concerns for Water Shielding in Fission Surface Power Applications
Schoenfeld, Michael P.; February 10, 2008; 10 pp.; In English; STAIF 2008, 10-14 Feb. 2008, Albuquerque, Mexico; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080015565

This paper presents an overview of radiolysis concerns with regard to water shields for fission surface power. A review of the radiolysis process is presented and key parameters and trends are identified. From this understanding of the radiolytic decomposition of water, shield pressurization and corrosion are identified as the primary concerns. Existing experimental and modeling data addressing concerns are summarized. It was found that radiolysis of pure water in a closed volume results in minimal, if any net decomposition, and therefore reduces the potential for shield pressurization and corrosion. With the space program focus m emphasize more on permanent return to the Moon and eventually manned exploration of Mars, there has been a renewed look at fission power to meet the difficult technical & design challenges associated with this effort. This is due to the ability of fission power to provide a power rich environment that is insensitive to solar intensity and related aspects such as duration of night, dusty environments, and distance from the sun, etc. One critical aspect in the utilization of fission power for these applications of manned exploration is shielding. Although not typically considered for space applications, water shields have been identified as one potential option due to benefits in mass savings and reduced development cost and technical risk (Poston, 2006). However, the water shield option requires demonstration of its ability to meet key technical challenges including such things as adequate natural circulation for thermal management and capability for operational periods up to 8 years. Thermal management concerns have begun to be addressed and are not expected to be a problem (Pearson, 2007). One significant concern remaining is the ability to maintain the shield integrity through its operational lifetime. Shield integrity could be compromised through shield pressurization and corrosion resulting from the radiolytic decomposition of water.
Author
Radiolysis; Decomposition; Fission; Temperature Control; Shielding; Water Splitting

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20080015663 NASA, Washington, DC, USA; NASA, Washington, DC, USA; NASA, Washington, DC, USA; NASA, Washington, DC, USA

U.S. Human Spaceflight: A Record of Achievement, 1961-2006

December 2007; 102 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/SP-2007-4541; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080015663

More than 45 years after the Mercury astronauts made their first brief forays into the new ocean of space, Earth orbit has become a busy arena of human activity. In that time, more than 300 people have traveled into orbit on U.S. spacecraft. The first astronauts went along stuffed into capsules barely large enough for their bodies, eating squeezetube food and peering out at Earth through tiny portholes.Their flights lasted only a matter of hours. Today, we routinely launch seven people at a time to spend a week living, working, and exploring aboard the Space Shuttle. In addition to regular launches, crew members from various nations keep a permanent human presence aboard the International Space Station (ISS). The history of spaceflight has seen not only an increase in the numbers of people traveling into orbit, but also marked improvements in their vehicles. Each successive spacecraft, from Mercury through Apollo and the Space Shuttle, has been larger, more comfortable, and more capable. Scientists working inside the Shuttle's Spacelab have many of the comforts of a laboratory on Earth, none of which were available when human spaceflight first began. Some projects, like Apollo, produced stunning firsts or explored new territory. Others notably, Skylab and the Space Shuttle advanced our capabilities by extending the range and sophistication of human operations in space. Both kinds of activity are vital to establishing a permanent human presence off Earth. Almost 50 years after the dawn of the age of spaceflight,we are learning not just to travel into space, but also to live and stay there.That challenge ensures that the decades to come will be just as exciting as the past decades have been.

Author

Earth Orbits; Spacecrews; Histories; Long Duration Space Flight; Aerospace Environments; Space Exploration; Manned Space Flight

Subject Term Index

Personal Author Index