National Aeronautics and Space Administration
Langley Research Center
Scientific and Technical Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 46 Number 16

August 18, 2008

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NASA STI Program ... in Profile

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

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- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

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- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

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Introduction

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

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

STAR includes citations to R&D results reported in:

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

The NASA STI Program

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

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

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NASA Center for AeroSpace Information (CASI)

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

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

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National Technical Information Service (NTIS)

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

The Federal Depository Library Program (FDLP)

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

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

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

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 46, NUMBER 16 AUGUST 18, 2008

01
AERONAUTICS (GENERAL)

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

20080026342 Purdue Univ., West Lafayette, IN, USA

Validation of High-Speed Turbulent Boundary Layer and Shock-Boundary Layer Interaction Computations with the OVERFLOW Code

Oliver, A. B.; Lillard, R. P.; Blaisdell, G. A.; Lyrintizis, A. S.; January 09, 2006; 15 pp.; In English; 44th AIAA Aerospace Sciences Meeting and Exhibit, 9-12 Jan. 2006, Reno, NV, USA

Contract(s)/Grant(s): NNJ04HI12G; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080026342

The capability of the OVERFLOW code to accurately compute high-speed turbulent boundary layers and turbulent shock-boundary layer interactions is being evaluated. Configurations being investigated include a Mach 2.87 flat plate to compare experimental velocity profiles and boundary layer growth, a Mach 6 flat plate to compare experimental surface heat transfer,a direct numerical simulation (DNS) at Mach 2.25 for turbulent quantities, and several Mach 3 compression ramps to compare computations of shock-boundary layer interactions to experimental laser doppler velocimetry (LDV) data and hot-wire data. The present paper describes outlines the study and presents preliminary results for two of the flat plate cases and two small-angle compression corner test cases.

Author

Turbulent Boundary Layer; Shock Wave Interaction; Hypersonic Speed; Velocity Distribution; Supersonic Speed; Laser Doppler Velocimeters; Direct Numerical Simulation

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.

20080026311 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aircraft Accident Brief: Crash During Approach to Landing, Business Jet Services, Ltd., Gulfstream G-1159A (G-III), N85VT, Houston Texas, on November 22, 2004

Nov. 02, 2006; 28 pp.; In English

Report No.(s): PB2007-100699; NTSB/AAB-06/06; No Copyright; Avail.: National Technical Information Service (NTIS)

On November 22, 2004, about 0615 central standard time, a Gulfstream G-1159A (G-III), N85VT, operated by Business Jet Services Ltd., struck a light pole and crashed about 3 miles southwest of William P. Hobby Airport (HOU), Houston, Texas, while on an instrument landing system (ILS) approach to runway 4. The two pilots and the flight attendant were killed, an individual in a vehicle near the airport received minor injuries, and the airplane was destroyed by impact forces. The airplane was being operated under the provisions of 14 Code of Federal Regulations (CFR) Part 91 on an instrument flight rules flight plan. Instrument meteorological conditions (IMC) prevailed at the time of the accident. The accident flight was scheduled to depart from Dallas Love Field Airport (DAL), Dallas, Texas, about 0500 as a positioning flight to HOU. The flight crew planned to pick up former President George H.W. Bush and other passengers at HOU and transport them to Guayaquil,

Ecuador. The flight was scheduled to depart HOU about 0654. The flight departed DAL about 0530. According to Business Jet Services flight operations and charter sales manager, the departure was delayed because of poor weather conditions at HOU and DAL. The captain was the flying pilot, and the first officer performed the nonflying pilot duties.
NTIS
Air Transportation; Commerce; Crash Landing; Crashes; Houston (TX); Safety Management; Transportation

20080029272 NASA Langley Research Center, Hampton, VA, USA
Concepts Leading to the National Aero-Space Plane Program
Wilhite, Alan W.; Powell, Richard W.; Scotti, Stephen J.; McClinton, Charles R.; Pinckney, S. Zane; Cruz, Christopher I.; Jackson, L. Robert; Hunt, James L.; Cerro, Jeffrey A.; Moses, Paul L.; January 08, 1990; 17 pp.; In English; 28th Aerospace Sciences Meeting, 8-11 Jan. 1990, Reno,NV, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 90-0294; Copyright; Avail.: CASI: A03, Hardcopy

Conceptual studies of two airbreathing single-stage-to-orbit horizontal takeoff and landing vehicles were conducted. To analyze the concepts, tools were developed to determine the aerodynamics, aerothermodynamics, propulsion, structures, and performance. The baseline vehicle did not have orbital capability. It had insufficient thrust-to-drag margin because of low-speed base drag and a poorly integrated propulsion system. The goal of reaching low-Earth orbit does appear to be feasible by utilizing advanced technologies in key areas. With advanced structures, materials, and subsystems, a conical configuration attained orbit with engines that wrap completely around the body to maximize thrust-to-drag margin. Boundary-layer transition, propulsion/airframe integration, advanced metal matrix composites, reusable cryogenic tankage, and advanced subsystems were identified as critical technology needs for airbreathing single-stage-to-orbit vehicles.
Author
Air Breathing Engines; National Aerospace Plane Program; Single Stage to Orbit Vehicles; Aerothermodynamics; Computational Fluid Dynamics

20080029320 Coburn (Joseph M.), Saint Louis, MO, USA
Landing Assist Probe Retention Strap
Muylaert, N. W., Inventor; Tebon, D., Inventor; 3 Jun 04; 35 pp.; In English
Contract(s)/Grant(s): DMH23-99-C-0111
Patent Info.: Filed Filed 3 Jun 04; US-Patent-Appl-SN-10-860-043
Report No.(s): PB2007-110065; No Copyright; Avail.: CASI: A03, Hardcopy

An aircraft landing assist apparatus is designed to be retrofit to existing aircraft having internal constructions that have been modified to support the apparatus. The apparatus is designed so that on rough landings of the aircraft on a ship deck, the apparatus will collapse in a controlled manner to avoid any damage to ammunition and/or fuel storage areas of the aircraft.
NTIS
Landing Aids; Patent Applications; Straps

20080029357 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Aviation Accident Report: Weather Encounter and Subsequent Collision into Terrain, Bali Hai Helicopter Tours, Inc., Bell 206B, N16849, Kalaheo, Hawaii, on September 24, 2004
Feb. 13, 2007; 66 pp.; In English
Report No.(s): PB2007-910404; NTSB/AAR-07/03; No Copyright; Avail.: National Technical Information Service (NTIS)

This report explains the accident involving a Bell 206B helicopter, N16849, registered to and operated by Bali Hai Helicopter Tours, Inc., of Hanapepe, Hawaii, which impacted mountainous terrain in Kalaheo, Hawaii, on the island of Kauai, 8.4 miles northeast of Port Allen Airport, in Hanapepe. The safety issues discussed in this report include the influence of pilot experience and operator scheduling on in-flight decision-making; the lack of Federal Aviation Administration (FAA) oversight of 14 Code of Federal Regulations Part 91 air tour operators; the need for national air tour safety standards; and the lack of direct FAA surveillance of commercial air tour operators in Hawaii.
NTIS
Accident Investigation; Aircraft Accidents; Collisions; Helicopters; Safety Management; Terrain; Transportation

20080030093 NASA Ames Research Center, Moffett Field, CA, USA; NASA Dryden Flight Research Center, Edwards, CA, USA; Eagle Engineering, Inc., Hampton, VA, USA

Influence of Vehicle Configuration and Flight Profile on X-30 Sonic Booms

Maglieri, Domenic J.; Sothcott, Victor E.; Hicks, John; October 29, 1990; 12 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NAS9-17900

Report No.(s): AIAA Paper-90-5224; Copyright; Avail.: CASI: A03, Hardcopy

A comprehensive study is being conducted to establish the sonic boom picture for the NASP X-30 vehicle in terms of its configuration and flight characteristics. The basic thrust of this study is to ascertain whether a sonic boom issue exists with the X-30 and, if SO, to define its magnitude and recommend approaches to mitigate the problem. The purpose of this paper is to provide the results of the study findings that begin with the applicability and limitations of sonic boom prediction methods to the X-30 configuration and flight profiles, an indication of the transition focus booms on ground overpressures, and an assessment of the influence of the atmosphere on boom propagation. Sonic boom signatures, overpressure levels, and footprints are presented and comparisons are made to the existing sonic boom data base that includes F-104, SR-71, Concorde, XB-70, and STS Orbiter sonic boom measurements extending out to about a Mach number of 23 and altitudes to about 250,000 feet. In addition, a comparison is made of the X-30 configuration in terms of its shape factor with current vehicles so as to provide an indication of the sensitivity of vehicle geometric changes on sonic booms and their minimization. The significant effects vehicle climb angle can exert on the ground overpressures is also discussed. Results of the study indicate that the X-30 sonic booms are no more of an issue than with previous vehicles in that its boom levels and signatures fall within past and current experience. Because of its design and operating capabilities, additional opportunities are available to further minimize boom levels. The X-30 transition focus boom which, of course, occurs on all vehicles when passing from subsonic to supersonic speeds, can be alleviated by delaying the point at which it reaches the ground until higher altitudes are acquired as a result of increased climb angles. The inherently higher Mach number operations of the X-30 suggest less signature variability, especially in the cruise mode, that results from the turbulence and thermal activities of the first few thousand feet of the earth's boundary layer. Lesser variability means better predictability, more consistency relative to sonic boom exposures, and fewer booms of intensities greater than expected. All of these features combined with the relatively low frequency of X-30 flights will contribute significantly to minimizing sonic boom concerns.

Author

Flight Characteristics; Flight Paths; Mach Number; Overpressure; Sonic Booms; Supersonic Speed; National Aerospace Plane Program

20080030096 Complere, Inc., Palo Alto, CA, USA

Transition and Turbulence Measurements in Hypersonic Flows

Owen, F. K.; October 29, 1990; 22 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Contract(s)/Grant(s): F33615-88-C-3014; NAS2-12853

Report No.(s): AIAA Paper-90-5231; Copyright; Avail.: CASI: A03, Hardcopy

Although extensive progress has been made in computational fluid mechanics, reliable flight vehicle designs and modifications still cannot be made without recourse to extensive wind tunnel testing. Future progress in the computation of hypersonic flowfields is restricted by the need for reliable transition and turbulence modeling data bases which could be used for the development of empirical models for use in numerical codes. Currently, there are few compressible flow measurements which could be used for this purpose and, since additional shear stress terms may be significant at high Mach numbers, models based on incompressible measurements may not be realistic. In this paper, techniques for transitional and turbulent flow measurements will be reviewed and the status of transition and turbulence research in support of turbulence modeling programs discussed. Assessments will also be made of the potential for hot wire and laser velocimeter measurements of turbulent fluctuations in hypersonic flowfields. The results of recent experiments conducted in two hypersonic wind tunnels will be presented and comparisons made with previous hot wire turbulence measurements.

Author

Hypersonic Flow; Transition Flow; Turbulent Flow; Measuring Instruments

20080030099 Vanderbilt Univ., Nashville, TN, USA; NASA Langley Research Center, Hampton, VA, USA

Finite-Rate Chemistry Effects in a Mach 2 Reacting Flow

Cheng, T. S.; Wehrmeyer, J. A.; Pitz, R. W.; Jarrett, O., Jr.; Northam, G. B.; June 24, 1991; 18 pp.; In English; AIAA/ASME/SAE 27th Joint Propulsion Conference, 24-27 Jun. 1991, Sacramento, CA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NGT-50263; NAG1-770; NSF CTS-8657130

Report No.(s): AIAA Paper-91-2320; Copyright; Avail.: CASI: A03, Hardcopy

Ultraviolet (UV) spontaneous vibrational Raman scattering and laser-induced predissociative fluorescence (LIPF) are combined and applied to a supersonic flame. For the first time, simultaneous measurements of temperature, major species (H2, 02, N2 H2O), and minor species (OH) concentrations are obtained with a 'single' excimer laser in a supersonic lifted hydrogen-air diffusion flame. In the supersonic flame, a small amount of reaction occurs upstream of the lifted flame base, due to shock wave interactions and mixing with hot vitiated air. The strong turbulent mixing and high total enthalpy fluctuations lead to non-equilibrium values of temperature, and major and minor species concentrations. Combustion occurs farther downstream of the lifted region where slow three-body recombination reactions result in superequilibrium OH concentrations that depress the temperatures below their equilibrium values. Farther downstream, ambient air entrainment contaminates flame properties.

Author

Supersonic Speed; Hypersonics; Supersonics; Diffusion Flames

20080030199 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aviation Accident Report: Attempted Takeoff From Wrong Runway Comair Flight 5191, Bombardier CL-600-2B19, N431CA, Lexington, Kentucky, on August 27, 2006

Jul. 26, 2007; 174 pp.; In English

Report No.(s): PB2007-910406; NTSB/AAR-07/05; No Copyright; Avail.: National Technical Information Service (NTIS)

This report explains the accident involving a Bombardier CL-600-2B19, N431CA, operated by Comair, Inc., which crashed during takeoff from Blue Grass Airport, Lexington, Kentucky. The safety issues discussed in this report focus on the need for (1) improved flight deck procedures, (2) the implementation of cockpit moving map displays or cockpit runway alerting systems, (3) improved airport surface marking standards, and (4) air traffic control policy changes in the areas of taxi and takeoff clearances and task prioritization. Safety recommendations concerning these issues are addressed to the Federal Aviation Administration.

NTIS

Accident Investigation; Aircraft Accidents; Runways; Safety Management; Takeoff; Transportation

20080030200 National Transportation Safety Board, Washington, DC USA

National Transportation Safety Board Aviation Accident Report: In-flight Separation of Right Wing Flying Boat, Inc., (doing business as Chalks Ocean Airways) Flight 101 Grumman Turbo Mallard (G-73T), N2969, Port of Miami, Florida,on December 19, 2005

May 30, 2007; 74 pp.; In English

Report No.(s): PB2007-910405; NTSB/AAR-07/04; No Copyright; Avail.: CASI: A04, Hardcopy

This report explains the accident involving Flying Boat, Inc. (doing business as Chalks Ocean Airways) Flight 101, a Grumman Turbo Mallard (G-73T) amphibious airplane, which crashed into a shipping channel adjacent to the Port of Miami, Florida, shortly after takeoff from the Miami Seaplane Base. Safety issues discussed in this report focus on air carrier maintenance programs and practices and Federal Aviation Administration (FAA) oversight procedures for air carrier maintenance programs. Safety recommendations concerning these issues are addressed to the FAA.

NTIS

Accident Investigation; Aircraft Accidents; Amphibious Aircraft; Chalk; Commerce; Oceans; Safety Management; Transportation

20080030370 NASA Dryden Flight Research Center, Edwards, CA, USA

Detection and Characterization of Boundary-Layer Transition in Flight at Supersonic Conditions Using Infrared Thermography

Banks, Daniel W.; July 2008; 18 pp.; In English; 13th International Symposium on Flow Visualization, 1-4 Jul. 2008, Nice, France; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030370

Infrared thermography is a powerful tool for investigating fluid mechanics on flight vehicles. (Can be used to visualize and characterize transition, shock impingement, separation etc.). Updated onboard F-15 based system was used to visualize supersonic boundary layer transition test article. (Tollmien-Schlichting and cross-flow dominant flow fields). Digital Recording improves image quality and analysis capability. (Allows accurate quantitative (temperature) measurements, Greater enhancement through image processing allows analysis of smaller scale phenomena).

Author

Infrared Radiation; Thermography; Fluid Mechanics; F-15 Aircraft; Digital Systems; Data Recording; Image Processing; Temperature Measurement; Supersonic Boundary Layers

20080030440 Purdue Univ., West Lafayette, IN USA

Morphing Aircraft Technology - New Shapes for Aircraft Design

Weisshaar, Terrence A; Oct 1, 2006; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479821; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479821

No abstract available

Aircraft Design; Shapes; Technology Assessment

20080030447 Manchester Univ., UK

Adaptive Stiffness Structures for Air Vehicle Drag Reduction

Cooper, J E; Oct 1, 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479831; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479831

No abstract available

Aerospace Vehicles; Drag Reduction; Stiffness

20080030792 ASRC Aerospace Corp., Cleveland, OH, USA

Effects of a Rotating Aerodynamic Probe on the Flow Field of a Compressor Rotor

Lepicovsky, Jan; June 2008; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNC06BA07B; 561581.02.08.03.21.02

Report No.(s): NASA/CR-2008-215215; E-16503; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030792

An investigation of distortions of the rotor exit flow field caused by an aerodynamic probe mounted in the rotor is described in this paper. A rotor total pressure Kiel probe, mounted on the rotor hub and extending up to the mid-span radius of a rotor blade channel, generates a wake that forms additional flow blockage. Three types of high-response aerodynamic probes were used to investigate the distorted flow field behind the rotor. These probes were: a split-fiber thermo-anemometric probe to measure velocity and flow direction, a total pressure probe, and a disk probe for in-flow static pressure measurement. The signals acquired from these high-response probes were reduced using an ensemble averaging method based on a once per rotor revolution signal. The rotor ensemble averages were combined to construct contour plots for each rotor channel of the rotor tested. In order to quantify the rotor probe effects, the contour plots for each individual rotor blade passage were averaged into a single value. The distribution of these average values along the rotor circumference is a measure of changes in the rotor exit flow field due to the presence of a probe in the rotor. These distributions were generated for axial flow velocity and for static pressure.

Author

Aerodynamic Characteristics; Axial Flow; Compressor Rotors; Flow Measurement; Flow Distribution; Static Pressure; Fluid Flow

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.

20080030481 National Research Council of Canada, Ottawa, Ontario Canada
Advanced Materials and Multifunctional Structures for Aerospace Vehicles
Patnaik, P C; Chen, W R; Oct 1, 2006; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479897; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479897

No abstract available

Aerospace Vehicles; Composite Materials

20080030484 Naval Postgraduate School, Monterey, CA USA
Modeling Airport Ground Operations using Discrete Event Simulation (DES) and X3D Visualization
Ouerghi, Nabil; Mar 2008; 113 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479906; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479906

Almost all flight simulators are centered on the problems that can occur during flight, whereas airport ground traffic problems are seldom addressed and are growing considerably. A number of precautions have been directed by the U.S. Federal Aviation Administration (FAA) to overcome these challenges, such as pilot training and adding taxiway indicator signals to help pilots follow specific paths when taxiing. Further work is needed. This thesis simulates the problem of Ground Traffic incursions. Discrete Event Simulation (DES) and the Viskit tool are used to build two scenarios describing the takeoff and the landing maneuvers including potential ground incidents. It also presents the different techniques used to build 3D graphics models for the airplanes and the airport environment using Extensible 3D (X3D) graphics. After running the simulation a number of times with different parameters, collected data support basic analysis and potential conclusions. This approach demonstrates a proof-of-concept capability worthy of future work.
DTIC

Airports; Flight Simulators; Ground Operational Support System; Military Operations; Simulation; Traffic

20080030664 Naval Postgraduate School, Monterey, CA USA
Innovations in Air Insertion (Involving Parachutes)
Brasfield, Samuel P; Mar 2008; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480338; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Numerous innovations in parachuting and related technologies have developed in recent years that had their genesis in the military application of parachutes, which started early in the twentieth century. Although many of these new concepts have not been applied to military operations, they may have much to offer in the future. The innovations covered in this study involve concepts that could revolutionize the use of parachutes in warfare, and focus more on methods than materials. However, some of these related technologies will also be examined. The five systems covered are: 1) wing suit 2) rigid wing 3) High Glide Ratio (HGR) parachute 4) fixed-object parachuting (commonly known as BASE) and 5) tandem systems. These innovations provide many advantages and improvements to existing systems such as: greater offset for insertion for HAHO and HALO; a capability to conduct infiltration and exfiltration with the same compact equipment; greater capacity for inserting personnel and equipment; and the capacity for expanded use of the parachute in a constrained environment.
DTIC

Descent; Military Personnel; Parachute Descent; Parachutes

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.

20080026309 Coburn (Thompson) LLP, Saint Louis, MO, USA
Landing Assist Apparatus with Offset Landing Probe
Muylaert, N. W., Inventor; Tebon, D., Inventor; Lahaie, R. E., Inventor; Lindsay, W. E., Inventor; 3 Jun 07; 35 pp.; In English
Contract(s)/Grant(s): DMH23-99-C-0111
Patent Info.: Filed Filed 3 Jun 07; US-Patent-Appl-SN-10-860-446
Report No.(s): PB2007-110527; No Copyright; Avail.: CASI: A03, Hardcopy

An aircraft landing assist apparatus is designed to be retrofit to existing aircraft having internal constructions that have been modified to support the apparatus. The apparatus is designed so that on rough landings of the aircraft on a ship deck, the apparatus will collapse in a controlled manner to avoid any damage to ammunition and/or fuel storage areas of the aircraft. NTIS

Patent Applications; Aircraft Landing

20080026318 Southwest Sciences, Inc., Santa Fe, NM, USA
Oxygen Sensor for Aircraft Fuel Inerting Systems
Chen, S. J., Inventor; Silver, J. A., Inventor; 4 Jan 05; 14 pp.; In English
Contract(s)/Grant(s): NSF-DMI-0319786
Patent Info.: Filed Filed 4 Jan 05; US-Patent-Appl-SN-11-029-436
Report No.(s): PB2007-110061; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus and method for monitoring oxygen concentrations in fuel tank ullage comprising providing a sensor head comprising an optical cavity, exposing the optical cavity to an ambient gaseous environment of a fuel tank or air separation module, via a laser light source emitting wavelength modulated light through the cavity, and receiving the wavelength modulated light with a detector.
NTIS

Fuel Systems; Fuel Tanks; Gas Detectors; Oxygen; Patent Applications; Ullage

20080026319 Coburn (Thompson) LLP, Saint Louis, MO, USA
Landing Assist Probe Mounting System
Muylaert, N. W., Inventor; Tebon, D., Inventor; Lahaie, R. E., Inventor; Lindsay, W. E., Inventor; 3 Jun 04; 35 pp.; In English
Contract(s)/Grant(s): DAAH23-99-C-0111
Patent Info.: Filed Filed 3 Jun 04; US-Patent-Appl-SN-10-860-474
Report No.(s): PB2007-110526; No Copyright; Avail.: CASI: A03, Hardcopy

An aircraft landing assist apparatus is designed to be retrofit to existing aircraft having internal constructions that have been modified to support the apparatus. The apparatus is designed so that on rough landings of the aircraft on a ship deck, the apparatus will collapse in a controlled manner to avoid any damage to ammunition and/or fuel storage areas of the aircraft. NTIS

Landing Aids; Mounting; Patent Applications

20080026357 National Aero-Space Plane Joint Program Office, Wright-Patterson AFB, OH, USA
The National Aero-Space Plane Program
Barthelemy, Robert R.; July 20, 1989; 9 pp.; In English; AIAA First National Aero-Space Plane Conference, 20=21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-89-5001; Copyright; Avail.: CASI: A02, Hardcopy

NASP--the National Aero-Space Plane--represents a vision--not just of an airplane flying at speeds of Mach 25---not just of a craft which can routinely go from earth to space and back--not just of great technological breakthroughs--but of America at its best, at its boldest, at its most creative. NASP is more than a program, more than the synergism of technologies, more than a capability that may change the way we move through the world and the aerospace around it. NASP is the focus for a transformation to what is possible. NASP can be described in a number of ways: technological, programmatic, utilitarian, and philosophical. In each case, NASP represents a departure from the evolutionary approach and leads to a potential change in

our thinking about what is possible. Let's review each aspect of the NASP program. The National Aero-Space Plane requires the synergism of several major technology breakthroughs. The National Aero-Space Plane requires a fundamental shift in our thinking concerning the management and implementation of high-technology program. The National Aero-Space Plane opens up new possibilities in aeronautical and aerospace transportation that go beyond our traditional approaches in this area. The National Aero-Space Plane is the foundation upon which national cooperation, collaboration, and development can be built. Author

Air Transportation; National Aerospace Plane Program; Technology Utilization; X-30 Vehicle

20080029254 NASA Langley Research Center, Hampton, VA, USA

Enabling Technologies Research and Development Structures

Davis, John, Jr.; Murrow, Harold N.; July 20, 1989; 29 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations

Report No.(s): AIAA-89-5011; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the technologies and research and development that is used for aircraft structures. The contents include: 1) Design requirements; 2) Critical Problem areas; 3) Nose caps; 4) Leading edges; 5) Actively cooled Structures; 6) High Temperature Control Surfaces; 7) Seals; 8) Methodology; 9) Instrumentation; and 10) Facilities.

CASI

Aircraft Structures; Fabrication; Technology Utilization; Aircraft Models; Computational Fluid Dynamics

20080030095 National Aero-Space Plane Joint Program Office, Wright-Patterson AFB, OH, USA

Flight Testing Hypersonic Vehicles - The X-30 and Beyond

Parks, S.; Waldman, B.; October 29, 1990; 7 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper-90-5229; Copyright; Avail.: CASI: A02, Hardcopy

The 1990's offers the opportunity to explore a new regime of air-breathing hypersonic flight. Recent developments in light weight high strength materials, propulsion systems and computational capabilities will allow, for the first time aerospace vehicles to operate in the intense environment required for efficient air-breathing engine operation. The potential now exists for a new class of reusable space-capable vehicles that are significantly lighter weight than rocket-powered vehicles due to the greatly reduced need to carry on-board oxygen. A number of countries are pursuing vehicle designs that operate in this arena. Examples include The UK's HOTOL, the German SANGER and the USA National Aerospace Plane (NASP) or X-30. The potential utility of these vehicles is tremendous including rapid, inexpensive access to space, on call reconnaissance, and even global transportation. Flight testing hypersonic vehicles will require innovative thought. Even for an 'X' vehicle like the X-30, designing for ease of testing may not be practical. The pure geometry of a Mach 15, 2g turn from Edwards AFB in California can take the vehicle over Chicago. This has interesting implications for the flight test community. Testing of these vehicles may require a melding of techniques developed for launch vehicles with the more traditional 'build up' approach used with aircraft. Concepts for testing hypersonic vehicles must be developed in parallel with vehicle design. This paper will explore various alternatives for flight teat and their applicability to testing air-breathing hypersonic vehicles. Emphasis will be placed on the X-30 and will build on the effort already accomplished by the X-30 test team at Edwards AFB. The advantages and disadvantages of both launch vehicle and traditional aircraft test techniques will be discussed. This will be followed by an analysis of how these concepts may be combined to test hypersonic vehicles.

Derived from text

Aerospace Planes; Air Breathing Engines; Flight Tests; Hypersonic Flight; Hypersonic Vehicles; National Aerospace Plane Program; Test Vehicles

20080030397 Naval Postgraduate School, Monterey, CA USA

Aircraft Pilot Situational Awareness Interface for Airborne Operation of Network Controlled Unmanned Systems (US)

Demirel, Ibrahim; Mar 2008; 117 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479681; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479681

This thesis research is focused on Network Centric Operations with Unmanned Systems (US). It specifically focuses on the currently underdeveloped area of aircraft pilot decision support for operating USs, including Unmanned Aerial Vehicles (UAV), Unmanned Ground Vehicles (UGV) and Unmanned Surface Vehicles (USV), over the network from the board of an aircraft. Building on Landreth and Glass's thesis on controlling UAV over the network, including from another manned

aircraft, this thesis aims to ease implementation and usage of the, SA interface. The SA interface enables the operator to be aware of what is going on around the Unmanned System while it is being operated from a remote location, and to react in the best possible way within a reasonable amount of time. The Rascal UAV interface was reviewed, SA-related problems were identified, and solutions to those problems were proposed. After our studies we proposed eight possible solutions to implement, and one of them is implemented and used. However, due to some problems, we could not test all our solutions. DTIC

Control; Control Systems Design; Drone Vehicles; Remotely Piloted Vehicles; Situational Awareness

20080030432 Boeing Co., Seattle, WA USA

Structurally Integrated X-Band Array Development

Banks, David; Berden, Matt; Baron, Bill; Tenbarge, Joseph; Oct 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479802; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479802

No abstract available

Airframes; Antenna Arrays; Microwave Antennas; Superhigh Frequencies; Systems Integration

20080030446 Naval Research Lab., Washington, DC USA

Multifunctional Structure-Power for Electric Unmanned Systems

Thomas, J P; Qidwai, M A; Baucom, J N; Pogue, W R; Oct 1, 2006; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479830; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479830

No abstract available

Composite Materials; Drone Vehicles

20080030461 Air Mobility Command, Scott AFB, IL USA

Transforming AMC Test & Evaluation: Using Effects-Based Mobility and AFSO21 to Build a Direct Investment into Air Force Modernization and Recapitalization (Preprint)

Chaudhary, Ravi I; McMillan, Adam J; Jan 2008; 13 pp.; In English

Report No.(s): AD-A479854; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479854

From 2008 to 2013, American taxpayers will spend over 30 billion dollars to increase the global maneuverability of the American Military. Central to this investment is verifying that dollars invested by the USAF Air Mobility Command (AMC) yield the effects they were intended to produce. Upcoming programs include the KC-X, Joint Cargo Aircraft (JCA), and a variety of modernization/recapitalization (modern/recap) programs for the C-5, C-130, C-130J, KC-10, KC-135 and C-17. With an increasing amount of AMC operational test workload on the horizon, standing up a traditional test and evaluation (T&E) organization seems like a viable option. Unfortunately, large personnel reductions needed to support modern/recap make garnering manpower a challenging task to advocate with the corporate Air Force. However, the authors met this challenge by re-building an organization that represents a direct investment into modern/recap. They conducted a six-month study and concluded that a right sized operational test force increases potential for cost reduction, because it is lean enough to create savings for Air Force modern/recap programs. In order to achieve this vision, the authors used an emerging doctrine called Effects-Based Mobility (EBM) to connect the joint fight with the T&E Enterprise. The authors also used Air Force Smart Operations (AFSO21) to pinpoint shortfalls in the existing organization and quantify potential cost savings. When used together, this analysis cut overhead and transformed the organization into a predictive, lean organization that represents a direct investment into Air Force Modernization and Recapitalization programs. DTIC

Budgeting; Evaluation; Government Procurement; Life (Durability); Mobility; System Effectiveness

20080030465 Dassault Aviation, Saint-Cloud, France

Multifunctional Structures/Integration of Sensors and Antennas. Technical Evaluation Report

Chaumette, Daniel; Jan 2006; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479858; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479858

No abstract available

Airframes; Technology Assessment

20080030477 La Sapienza Univ., Rome, Italy
Dynamic Analysis with Fibre Optic Sensors for Structural Health Monitoring
Paolozzi, Antonio; Gasbarri, Paolo; Oct 1, 2006; 25 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479893; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479893
No abstract available
Aircraft; Fibers; Health; Nondestructive Tests; Optical Measuring Instruments

20080030478 State Univ. of New York, Stony Brook, NY USA
Innovative Multifunctional Concepts Enabled by Novel Fabrication Strategies
Sampath, Sanjay; Gambino, R; Gouldstone, C; Wu, H; Brogan, J; Oct 1, 2006; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479894; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479894
No abstract available
Aircraft; Fabrication

20080030479 Royal Military Academy, Brussels, Belgium
Smart Helicopter Blade Using Piezoelectric Actuators for both Cyclic and Collective Pitch Control
Giannopoulos, G; Santafe, F; Vantomme, J; Buysschaert, F; Hendrick, P; Oct 1, 2006; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479895; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479895
No abstract available
Actuators; Drone Vehicles; Helicopters; Piezoelectric Actuators; Piezoelectricity

20080030480 Dassault Aviation, Saint-Cloud, France
Shape Memory Alloys Application: Trailing Edge Shape Control
Berton, Benoit; Oct 1, 2006; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479896; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479896
No abstract available
Aircraft; Shape Control; Shape Memory Alloys; Trailing Edges

20080030482 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
High Gain Printed Phased Array for SAR Applications Using Planar Electromagnetic Band-Gap Technology
Llombart, N; Neto, A; Gerini, G; Oct 1, 2006; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479898; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479898
No abstract available
Aircraft; Energy Gaps (Solid State); High Gain; Phased Arrays; Printed Circuits; Synthetic Aperture Radar

20080030483 Forschungsgesellschaft fuer Angewandte Naturwissenschaften e.V, Wachtberg-Werthhoven, Germany
Deformation and Vibration of Conformal Antenna Arrays and Compensation Techniques
Knott, Peter; Oct 1, 2006; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479899; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479899
No abstract available
Aircraft; Antenna Arrays; Deformation; Vibration

20080030491 Alenia Aeronautica, Turin, Italy

Alenia Shm Fiber Optic Bragg Grating (Fobg) Strain Sensors Technology: Applications And Requirements

Camerlingo, F P; Cavaccini, G; Ciliberto, A; Voto, C; Iodice, Mario; Pezzuti, F; Oct 2006; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479929; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479929

No abstract available

Bragg Gratings; Fiber Optics

20080030492 Anacapa Sciences, Inc., Santa Barbara, CA USA

Team Performance during Combat Mission Training: A Conceptual Model and Measurement Framework

Spiker, Alan; Tourville, Steven J; Silverman, Denise R; Nullmeyer, Robert T; Nov 1, 1996; 68 pp.; In English

Contract(s)/Grant(s): F41624-95-C-5011; Proj-1123

Report No.(s): AD-A479937; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479937

This report presents a conceptual model that will guide on-site research on team training effectiveness research at the 58th Special Operations Wing, Kirtland AFB, New Mexico. An objective is to identify the characteristics of effective, mission-ready aircrews to improve training procedures and technologies. Initial focus is on MC-130P aircrew performance during Annual Refresher Training, but the principles underlying effective combat teams should apply to other weapon systems. The report begins by tracing the evolution of team training from its roots in cockpit resource management(CRM) to its subsequent incorporation into combat mission training(CMT) by all three military services. A measurement model is then presented that links cordination process to team performance and mission outcome. The model assumes that team coordination: is necessary for mission success, is a multidimensional property of the team; and emerges over time in response programmed training events. Then the report discusses the methodological requirements for conducting CMT-based team performance research, including hypotheses to be tested, the basic experimental design, data collection instruments, key issues, and a multistep strategy for data analysis. We conclude by discussing anticipated research and development impacts, including portable mission readiness assessment tools, improved mission scenarios and candidate training improvement interventions.

DTIC

Combat; Education; Human Performance; Research Management; System Effectiveness; Teams

20080030496 Naval Postgraduate School, Monterey, CA USA

Distributed Beamforming in a Swarm UAV Network

Kocaman, Ibrahim; Mar 2008; 91 pp.; In English

Report No.(s): AD-A479952; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479952

The use of wireless communication techniques and network centric topologies with unmanned aerial vehicles (UAV) within modern warfare concepts makes it possible to utilize new distributed beamforming applications. The objective of this research is to combine the concept of wireless beamforming in opportunistic random arrays with the concept of swarm UAVs. A considerable amount of research has already been done about the feasibility and advantages of opportunistic arrays for a single platform. Distributed beamforming techniques are widely applied by many researchers. The use of swarm UAV concepts for a widely dispersed wirelessly networked opportunistic array may anticipate many advantages over single platform-borne opportunistic arrays. Major challenges are synchronization and localization, which are caused by the mobile structure of the proposed network topology. Possible solutions to these problems are proposed. In this thesis the use of swarm UAVs for jamming is analyzed. Closed form expressions for jamming power versus the number of UAVs, ranges, degree of transmitter coherence, and quality of beamforming are derived. It was found that even for low quality beamforming (large phase errors, or poor synchronization) significant improvements in system performance is still achievable.

DTIC

Beamforming; Drone Vehicles; Wireless Communication

20080030584 KT-Systems, Euerbach, Germany
Practicability Issues of Sensor-Based Damage Detection on Military Platforms
Kress, Klaus-Peter; Oct 2006; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480008; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Damage; Detection; Fatigue Life; Inspection; Systems Integration

20080030591 IDS Ingegneria dei Sistemi S.p.A., Pisa, Italy
Conformal Antennas and Integrated Design Procedures
Bandinelli, Mauro; Citriniti, Aldo; Guidoni, Antonio; Oct 1, 2006; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480020; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Aircraft Design; Helicopters; Systems Integration

20080030618 Naval Postgraduate School, Monterey, CA USA
U.S. Unmanned Aerial Vehicles (UAVs) and Network Centric Warfare (NCW): Impacts on Combat Aviation Tactics from Gulf War I Through 2007 Iraq
Kurkcu, Coskun; Oveyik, Kaan; Mar 2008; 159 pp.; In English
Report No.(s): AD-A480077; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Unmanned aerial vehicles (UAVs) are an increasingly important element of many modern militaries. Their success on battlefields in Afghanistan, Iraq, and around the globe has driven demand for a variety of types of unmanned vehicles. Their proven value consists in low risk and low cost, and their capabilities include persistent surveillance, tactical and combat reconnaissance, resilience, and dynamic re-tasking. This research evaluates past, current, and possible future operating environments for several UAV platforms to survey the changing dynamics of combat-aviation tactics and make recommendations regarding UAV employment scenarios to the Turkish military. While UAVs have already established their importance in military operations, ongoing evaluations of UAV operating environments, capabilities, technologies, concepts, and organizational issues inform the development of future systems. To what extent will UAV capabilities increasingly define tomorrow's missions, requirements, and results in surveillance and combat tactics? Integrating UAVs and concepts of operations (CONOPS) on future battlefields is an emergent science. Managing a transition from manned to unmanned and remotely piloted aviation platforms involves new technological complexity and new aviation personnel roles, especially for combat pilots. Managing a UAV military transformation involves cultural change, which can be measured in decades.
DTIC
Combat; Gulfs; Iraq; Military Operations; Pilotless Aircraft; Reconnaissance; Remotely Piloted Vehicles; Tactics; Warfare

20080030938 National Aero-Space Plane Joint Program Office, Wright-Patterson AFB, OH, USA
National Aero-Space Plane Technology Development Overview
Wright, Howard T.; July 20, 1989; 12 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-89-5003; Copyright; Avail.: CASI: A03, Hardcopy
The paper discusses the management structure and organization that was developed in early 1986 to focus the national technology resource pool on the enabling technologies for the National AeroSpace Plane (NASP). The NASP program is developing technologies in parallel with total system studies that are aimed at single stage to orbit (SSTO) capability. In order to manage the technology development seven teams were established by discipline and charged with the task of recommending specific programs to be funded by the NASP Joint Program Office (JPO). The teams were staffed by representatives from NASA Research Centers, Johns Hopkins University, and the Air Force Laboratories at Wright-Patterson AFB. In addition several special teams were established to recommend development programs for specific areas of technical concern that became apparent when the total system studies identified the technology to be critical and sensitive in the analysis that would enable a SSTO vehicle.
Author
National Aerospace Plane Program; Aerospace Planes; Technology Assessment; Research and Development; Project Planning

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also 04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.

20080030372 NASA Glenn Research Center, Cleveland, OH, USA

Wave Propagation Through Inhomogeneities With Applications to Novel Sensing Techniques

Adamovsky, G.; Tokars, R.; Varga, D.; Floyd B.; June 2008; 19 pp.; In English; 46th AIAA Aerospace Science Meeting and Exhibit, 7-10 jan. 2008, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 599489.02.07.03.06.02.01

Report No.(s): NASA/TM-2008-215185; AIAA Paper-2008-255; E-16429; Copyright; Avail.: CASI: A03, Hardcopy

The paper describes phenomena observed as a result of laser pencil beam interactions with abrupt interfaces including aerodynamic shocks. Based on these phenomena, a novel flow visualization technique based on a laser scanning pencil beam is introduced. The technique reveals properties of light interaction with interfaces including aerodynamic shocks that are not seen using conventional visualization. Various configurations of scanning beam devices including those with no moving parts, as well as results of 'proof-of-concept' tests, are included.

Author

Beam Interactions; Flow Visualization; Laser Beams; Wave Propagation; Laser Applications; Pencil Beams

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.

20080026317 Sandia National Labs., Albuquerque, NM USA

Suppression of Pool Fires with HFC-125 in a Simulated Engine Nacelle

Hewson, J. C.; Keyser, D. R.; Jun. 2007; 114 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Report No.(s): DE2007-912659; SAND2007-3442; No Copyright; Avail.: National Technical Information Service (NTIS)

CFD simulations are conducted to predict the distribution of fire suppressant in an engine nacelle and to predict the suppression of pool fires by the application of this suppressant. In the baseline configuration, which is based on an installed system, suppressant is injected through four nozzles at a rate fast enough to suppress all simulated pool fires. Variations that reduce the mass of the suppression system (reducing the impact of the suppression system on meeting mission needs) are considered, including a reduction in the rate of suppressant injection, a reduction in the mass of suppressant and a reduction in the number of nozzles. In general, these variations should work to reduce the effectiveness of the suppression system, but the CFD results point out certain changes that have negligible impact, at least for the range of phenomena considered here. The results are compared with measurements where available. Comparisons with suppressant measurements are reasonable. A series of twenty-three fire suppression tests were conducted to check the predictions. The pre-test predictions were generally successful in identifying the range of successful suppression tests. In two separate cases, each where one nozzle of the suppression system was capped, the simulation results did indicate a failure to suppress for a condition where the tests indicated successful suppression. When the test-suppressant discharge rate was reduced by roughly 25%, the tests were in agreement with the predictions. That is, the simulations predict a failure to suppress slightly before observed in these cases. NTIS

Fires; Nacelles

20080029314 Conte (Francis L.), Swampscott, MA, USA
Chevron Film Cooled Wall
Lee, C. P., Inventor; Brassfield, S. R., Inventor; Bunker, R. S., Inventor; 23 Jun 04; 12 pp.; In English
Contract(s)/Grant(s): AF-F33615-02-C-2212
Patent Info.: Filed Filed 23 Jun 04; US-Patent-Appl-SN-10-874-900
Report No.(s): PB2007-110117; No Copyright; Avail.: CASI: A03, Hardcopy

A wall in a gas turbine engine includes inner and outer surfaces having a row of compound chevron film cooling holes extending therethrough. The chevron holes diverge both longitudinally and laterally between an inlet at the wall inner surface and a chevron outlet at the wall outer surface.
NTIS
Film Cooling; Gas Turbine Engines; Patent Applications; Walls

20080029334 McCormick, Paulding and Huber, LLP, Hartford, CT, USA; United Technologies Corp., East Hartford, CT, USA
Rotor Blade with a Stick Damper
Propheter, T. A., Inventor; Surace, R. C., Inventor; 27 May 04; 9 pp.; In English
Patent Info.: Filed Filed 27 May 04; US-Patent-Appl-SN-10-855-184
Report No.(s): PB2007-110628; No Copyright; Avail.: CASI: A02, Hardcopy

A rotor blade damper is provided that includes a body having a base, a tip, a first contact surface, a second contact surface, a trailing edge surface, and a leading edge surface. The trailing edge and the leading edge surfaces extend between the contact surfaces. The first contact surface, second contact surface, trailing edge surface, and leading edge surface all extend lengthwise between the base and the tip. The body includes at least one cooling aperture disposed adjacent the base, that has a diameter that is approximately equal to or greater than the width of the trailing edge surface adjacent the tip. The body tapers between the base and the tip such that a first widthwise cross-sectional area adjacent the base is greater than a second widthwise cross-sectional area adjacent the tip.
NTIS
Rotor Blades; Vibration Damping

20080030097 NASA Langley Research Center, Hampton, VA, USA
Shock Interference Heating in Scramjet Engines
Wieting, Allan R.; October 29, 1990; 9 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-90-5238; Copyright; Avail.: CASI: A02, Hardcopy

Experimental and analytical research sponsored by the NASA Langley Research center and the NASP Structures Technology Maturation Program to define critical aerothermal loads for the NASP engine is summarized. Presented is a review of (1) shock-shock interaction on the engine cowl leading edge that results in a supersonic jet impinging on the leading edge surface and causes the heat transfer rate to be amplified by a factor of 30 or more over the undisturbed (no shock interaction) flow stagnation point heat transfer rate, (2) the effectiveness of supersonic film cooling with and without the effects of an impinging oblique shock wave, and (3) oblique shock impingement in an axial compression corner.
Author
Shock Wave Interaction; Supersonic Combustion Ramjet Engines; Aerothermodynamics; Aerodynamic Loads; Heat Transfer

20080030791 TechLand Research, Inc., North Olmstead, OH, USA
Aerodynamic Design of a Dual-Flow Mach 7 Hypersonic Inlet System for a Turbine-Based Combined-Cycle Hypersonic Propulsion System
Sanders, Bobby W.; Weir, Lois J.; June 2008; 92 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS3-03110; WBS 599489.02.07.03.07.02.02
Report No.(s): NASA/CR-2008-215214; E-16505; TRR-121507; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030791

A new hypersonic inlet for a turbine-based combined-cycle (TBCC) engine has been designed. This split-flow inlet is designed to provide flow to an over-under propulsion system with turbofan and dual-mode scramjet engines for flight from takeoff to Mach 7. It utilizes a variable-geometry ramp, high-speed cowl lip rotation, and a rotating low-speed cowl that serves as a splitter to divide the flow between the low-speed turbofan and the high-speed scramjet and to isolate the turbofan at high

Mach numbers. The low-speed inlet was designed for Mach 4, the maximum mode transition Mach number. Integration of the Mach 4 inlet into the Mach 7 inlet imposed significant constraints on the low-speed inlet design, including a large amount of internal compression. The inlet design was used to develop mechanical designs for two inlet mode transition test models: small-scale (IMX) and large-scale (LIMX) research models. The large-scale model is designed to facilitate multi-phase testing including inlet mode transition and inlet performance assessment, controls development, and integrated systems testing with turbofan and scramjet engines.
Author
Supersonic Combustion Ramjet Engines; Hypersonic Inlets; Engine Inlets; Control Systems Design; Hypersonic Flight; Supersonic Speed; Turbofan Engines

20080030793 NASA Glenn Research Center, Cleveland, OH, USA
Aircraft Engine On-Line Diagnostics Through Dual-Channel Sensor Measurements: Development of a Baseline System
Kobayashi, Takahisa; Simon, Donald L.; June 2008; 22 pp.; In English; ASME Turbo Expo 2008 Gas Turbine Congress and Exposition, 9-13 Jun. 2008, Berlin, Germany; Original contains color illustrations
Contract(s)/Grant(s): NNCO6BA07B; WBS 645846.02.07.03.03.01
Report No.(s): NASA/TM-2008-215228; GT2008-50345; E-16515; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030793

In this paper, a baseline system which utilizes dual-channel sensor measurements for aircraft engine on-line diagnostics is developed. This system is composed of a linear on-board engine model (LOBEM) and fault detection and isolation (FDI) logic. The LOBEM provides the analytical third channel against which the dual-channel measurements are compared. When the discrepancy among the triplex channels exceeds a tolerance level, the FDI logic determines the cause of the discrepancy. Through this approach, the baseline system achieves the following objectives: (1) anomaly detection, (2) component fault detection, and (3) sensor fault detection and isolation. The performance of the baseline system is evaluated in a simulation environment using faults in sensors and components.
Author
Fault Detection; Diagnosis; On-Line Systems; Aircraft Engines

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.

20080026266 NASA Langley Research Center, Hampton, VA, USA
Analysis of a Dynamic Multi-Track Airway Concept for Air Traffic Management
Wing, David J.; Smith, Jeremy C.; Ballin, Mark G.; July 2008; 94 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 411931.02.21.07.01
Report No.(s): NASA/TP-2008-215323; L-19462; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080026266

The Dynamic Multi-track Airways (DMA) Concept for Air Traffic Management (ATM) proposes a network of high-altitude airways constructed of multiple, closely spaced, parallel tracks designed to increase en-route capacity in high-demand airspace corridors. Segregated from non-airway operations, these multi-track airways establish high-priority traffic flow corridors along optimal routes between major terminal areas throughout the National Airspace System (NAS). Air traffic controllers transition aircraft equipped for DMA operations to DMA entry points, the aircraft use autonomous control of airspeed to fly the continuous-airspace airway and achieve an economic benefit, and controllers then transition the aircraft from the DMA exit to the terminal area. Aircraft authority within the DMA includes responsibility for spacing and/or separation from other DMA aircraft. The DMA controller is responsible for coordinating the entry and exit of traffic to and from the DMA and for traffic flow management (TFM), including adjusting DMA routing on a daily basis to account for predicted weather and wind patterns and re-routing DMAs in real time to accommodate unpredicted weather changes. However, the DMA controller is not responsible for monitoring the DMA for traffic separation. This report defines the mature state concept, explores its feasibility and performance, and identifies potential benefits. The report also discusses (a) an analysis of a single DMA, which was modeled within the NAS to assess capacity and determine the impact of a single DMA on regional sector loads and conflict potential; (b) a demand analysis, which was conducted to determine likely city-pair

candidates for a nationwide DMA network and to determine the expected demand fraction; (c) two track configurations, which were modeled and analyzed for their operational characteristic; (d) software-prototype airborne capabilities developed for DMA operations research; (e) a feasibility analysis of key attributes in the concept design; (f) a near-term, transitional application of the DMA concept as a proving ground for new airborne technologies; and (g) conclusions. The analysis indicates that the operational feasibility of a national DMA network faces significant challenges, especially for interactions between DMAs and between DMA and non-DMA traffic. Provided these issues are resolved, sectors near DMAs could experience significant local capacity benefits.
Author
Airspace; High Altitude; Dynamic Control; Air Traffic Control; National Airspace System; Flight Paths; Operations Research

09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

20080030094 NASA Lewis Research Center, Cleveland, OH, USA
A Unique High Heat Flux Facility for Testing Hypersonic Engine Components
Melis, Matthew E.; Gladden, Herbert J.; October 29, 1990; 8 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-90-5228; Copyright; Avail.: CASI: A02, Hardcopy

A major concern in advancing the state-of-the-art technologies for hypersonic vehicles is the development of an aeropropulsion system capable of withstanding the sustained high thermal loads expected during hypersonic flight. Consequently, there is a need for experimental facilities capable of providing a high heat flux environment for testing component concepts and verifying analyses. A hydrogen/oxygen rocket engine was developed at the NASA Lewis Research Center to provide a high enthalpy/high heat flux environment for component evaluation. This 'Hot Gas Facility' is capable of providing heat fluxes ranging from 200 Btu/square ft/sec on flat surfaces up to 8000 Btu/square ft/sec at a leading edge stagnation point. Gas temperatures up to 5500 R can be attained as well as Reynolds numbers up to 360 000/ft. Test articles such as cowl leading edges, transpiration-cooled seals, fuel injectors and cooled panel concepts can be evaluated with gaseous hydrogen as coolant. This facility, its configuration and test capabilities, are discussed in detail. Results from flow characterization experiments are also shown and their implications considered. Future testing by the NASP community planned in the facility is outlined demonstrating the potential contributions to be made by this facility to hypersonic flight research
Author
Aircraft Engines; Coolants; Heat Flux; Hypersonics; National Aerospace Plane Program; Rocket Engines; Research Facilities

20080030768 NASA Langley Research Center, Hampton, VA, USA
Langley Hypersonic Facilities Complex-Description and Application
Miller, C. G.; Smith, F. M.; March 05, 1986; 41 pp.; In English; AIAA 14th Aerodynamlc Testing Conference, 5-7 Mar. 1986, West Palm Beach, Fl, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-86-0741-CP; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://www.aiaa.org/content.cfm?pageid=406

The Langley Hypersonic Facilities Complex (HFC) consists of hypersonic, blowdown wind tunnels developed and put into operation between the late 1950's and early 1970's. These facilities complement one another to presently provide ranges of Mach number from 6 to 22, unit Reynolds number from 0.1 to 15 million per foot, and normal shock density ratio from 4 to 12. Descriptions of these facilities are presented along with the testing techniques routinely used. Examples of the application of the HFC to generate data bases for proposed entry vehicles and for the verification of computer codes are given. Plans to upgrade the facilities to improve flow quality, productivity, capability and reliability are discussed.
Author
Hypersonics; Research Facilities; Blowdown Wind Tunnels; Hypersonic Wind Tunnels; Hypervelocity Wind Tunnels

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*.

20080029371 NASA Johnson Space Center, Houston, TX, USA
Genesis Spacecraft Science Canister Preliminary Inspection and Cleaning
Hittle, J. D.; Calaway, M. J.; Allton, J. H.; Warren, J. L.; Schwartz, C. M.; Stansbery, E. K.; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, Houston, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Genesis science canister is an aluminum cylinder (75 cm diameter and 35 cm tall) hinged at the mid-line for opening. This canister was cleaned and assembled in an ISO level 4 (Class 10) clean room at Johnson Space Center (JSC) prior to launch. The clean solar collectors were installed and the canister closed in the cleanroom to preserve collector cleanliness. The canister remained closed until opened on station at Earth-Sun L1 for solar wind collection. At the conclusion of collection, the canister was again closed to preserve collector cleanliness during Earth return and re-entry. Upon impacting the dry Utah lakebed at 300 kph the science canister integrity was breached. The canister was returned to JSC. The canister shell was briefly examined, imaged, gently cleaned of dust and packaged for storage in anticipation of future detailed examination. The condition of the science canister shell noted during this brief examination is presented here. The canister interior components were packaged and stored without imaging due to time constraints.
Derived from text
Cans; Cleaning; Inspection; Genesis Mission; Spacecraft Maintenance

20080029401 NASA Johnson Space Center, Houston, TX, USA
Leadership and Cultural Challenges in Operating the International Space Station
Clement, J. L.; Ritsher, J. B.; Saylor, S. A.; Kanas, N.; May 14, 2006; 1 pp.; In English; 77th Scientific Meeting of Aerospace Medical Assn., 14-18 May 2006, Orlando, Fl, USA; Copyright; Avail.: Other Sources; Abstract Only

Operating the International Space Station (ISS) involves an indefinite, continuous series of long-duration international missions, and this requires an unprecedented degree of cooperation across multiple sites, organizations, and nations. ISS flight controllers have had to find ways to maintain effective team performance in this challenging new context. The goal of this study was to systematically identify and evaluate the major leadership and cultural challenges faces by ISS flight controllers, and to highlight the approaches that they have found most effective to surmount these challenges. We conducted a qualitative survey using a semi-structured interview. Subjects included 14 senior NASA flight controllers who were chosen on the basis of having had substantial experience working with international partners. Data were content analyzed using an iterative process with multiple coders and consensus meetings to resolve discrepancies. To further explore the meaning of the interview findings, we also conducted some new analyses of data from a previous questionnaire study of Russian and American ISS mission control personnel. The interview data showed that respondents had substantial consensus on several leadership and cultural challenges and on key strategies for dealing with them, and they offered a wide range of specific tactics for implementing these strategies. Surprisingly few respondents offered strategies for addressing the challenge of working with team members whose native language is not American English. The questionnaire data showed that Americans think it is more important than Russians that mission control personnel speak the same dialect of one shared common language. Although specific to the ISS program, our results are consistent with recent management, cultural, and aerospace research. We aim to use our results to improve training for current and future ISS flight controllers.
Author
International Space Station; Mission Planning; International Cooperation; Leadership; Social Factors

20080030167 NASA Johnson Space Center, Houston, TX, USA
Space Shuttle Familiarization
Mellett, Kevin; June 06, 2006; 60 pp.; In English; Kansas Educator of the Year Award Banquet, 6 Jun. 2006, Wichita, KS, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030167

This slide presentation visualizes the NASA space center and research facility sites, as well as the geography, launching sites, launching pads, rocket launching, pre-flight activities, and space shuttle ground operations located at NASA Kennedy

Space Center. Additionally, highlights the international involvement behind the International Space Station and the space station mobile servicing system. Extraterrestrial landings, surface habitats and habitation systems, outposts, extravehicular activity, and spacecraft rendezvous with the Earth return vehicle are also covered.
CASI
Space Shuttles; NASA Space Programs; Space Missions

20080030240 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Technical Aspects of the Space Telescope Imaging Spectrograph Repair (STIS-R)
Rinehart, Stephen; January 29, 2008; 1 pp.; In English; Hubble Space Telescope Conference, 29-31 Jan. 2008, Bologna, Italy; No Copyright; Avail.: Other Sources; Abstract Only

In August 2004, the Hubble Space Telescope (HST) Space Telescope Imaging Spectrograph (STIS) ceased operation, due to a failure in the Side 2 Low Voltage Power Supply (LVPS2). LVPS2 provided power to the entire instrument, including all detectors and mechanisms. Following the LVPS2 failure, a team was assembled to analyze the fault and to determine if STIS repair (STIS-R) was feasible. The team concluded that by replacing a power supply board within LVPS2, STIS could be brought back to full functionality. STIS-R will be conducted during Servicing Mission 4 (SM4), and will consist of replacing the power supply board and a new passive cooling system. STIS-R will restore full function of the instrument with one of the two redundant sides of the instrument. In this presentation, we focus on the technical aspects associated with STISR.
Author
Hubble Space Telescope; Imaging Techniques; Spectrographs; Maintenance; Fracture Mechanics

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*.

20080026335 NASA Johnson Space Center, Houston, TX, USA
An Introduction to Rockets - or - Never Leave Geeks Unsupervised
Mellett, Kevin; April 27, 2006; 37 pp.; In English; An Introduction to Rockets, 5 Jun. 2006, Hutchinson, KS, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080026335

An introduction to rockets along with a brief history Newton's third law is presented. The contents include: 1) What is a Rocket?; 2) A Brief History; 3) Newton's Third Law; 4) A Brief History; 5) Mission Requirements; 6) Some Orbital Measurements; 7) Self Eating Watermelon; 8) Orbital Inclinations; 9) 28.5 Equatorial Orbit; 10) 51.6 Orbit (ISS); 11) Polar Orbit; 12) Geostationary Orbit; 13) Liquid Rocket; 13) Liquids vs. Solids; 14) Liquids; 15) Systems Integration; 16) Integration (NFL!); 17) Guidance Systems; 18) Vectored Thrust; 19) Spin Stabilization; 20) Aerodynamic Stability (Fire Arrows); and 21) Center of Gravity & Center of Pressure.
CASI
Histories; Rocket Launching; Rocket Engine Design; Systems Engineering

20080030386 Georgia Inst. of Tech., Atlanta, GA USA
Coordinated Resource Allocation Among Multiple Agents With Application to Autonomous Refueling and Servicing of Satellite Constellations
Tsiotras, Panagiotis; Dutta, Atri; Salazar-Cardozo, Alexandros; Mar 2008; 19 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0135
Report No.(s): AD-A479643; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479643

The objective of this work was to develop new methods for high-level decentralized control of multiple space agents (i.e., satellites and spacecraft) with the objective of coordinated action and decision making. The blanket underlying assumption in this work was the sharing of a common resource (information, consumables, fuel, etc) so that all agents satisfy their own needs in a time-critical, cost-effective, optimal fashion. As a specific example of interest to the US Air Force we have addressed the problem of coordinated refueling between several satellites in a constellation. Satellite refueling has the potential to revolutionize future spacecraft operations. Apart from eliminating the need to replace (otherwise perfectly operating) satellites due to depletion of onboard fuel, a satellite constellation with refueling capabilities could easily change orbital planes or even

have satellites move in non-Keplerian orbits. As a matter of fact, true formation flying (as opposed to orbiting) of spacecraft requires continuous thruster firing and the subsequent depletion of onboard fuel. Having the capability to continuously change the orbit of the satellites in a completely unpredictable manner will give unprecedented advantages to the US intelligence community.
DTIC
Autonomy; Refueling; Resource Allocation; Satellite Constellations

20080030649 General Accounting Office, Washington, DC USA
Space Acquisitions: DOD is Making Progress to Rapidly Deliver Low Cost Space Capabilities, but Challenges Remain
Chaplain, Cristina; Gallegos, Art; Durant, Maria; Harker, Jean; Holguin, Arturo; Sloan, Karen; Apr 2008; 22 pp.; In English Report No.(s): AD-A480205; GAO-08-516; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) invests heavily in space assets to provide the warfighter with intelligence, navigation, and other information critical to conducting military operations. In fiscal year 2008 alone, DoD expects to spend over $22 billion dollars on space systems. Despite this investment, senior military commanders have reported shortfalls in tactical space capabilities in each recent major conflict over the past decade. To provide short-term tactical capabilities as well as identify and implement long-term solutions to developing low-cost satellites, DoD initiated operationally responsive space (ORS). Following a 2006 GAO review of ORS, the Congress directed DoD to submit a report that sets forth a plan for providing quick acquisition of low-cost space capabilities. This report focuses on the status of DoD's progress in responding to the Congress and is based on GAO's review and analyses of ORS documentation and interviews with DoD and industry officials. GAO recommends that the Secretary of the Air Force develop an investment plan approved by stakeholders that identifies how to achieve future capabilities, establishes funding priorities, and implements mechanisms to measure progress. DoD concurred with the recommendation.
DTIC
Aerospace Systems; Artificial Satellites; Launch Vehicles; Low Cost; Management Planning; Procurement

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*.

20080029207 NASA Johnson Space Center, Houston, TX, USA
Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation
Pool, Sam L.; May 09, 2005; 7 pp.; In English; AsMA 76th Annual Scientific Meeting, 9-13 May 2005, Alexandria, VA, USA; See also 20080029208 - 20080029213; No Copyright; Avail.: CASI: A02, Hardcopy

This paper presents the aeromedical lessons learned from the Space Shuttle Columbia Accident Investigation. The contents include: 1) Introduction and Mission Response Team (MRT); 2) Primary Disaster Field Office (DFO); 3) Mishap Investigation Team (MIT); 4) Kennedy Space Center (KSC) Mishap Response Plan; 5) Armed Forces Institute of Pathology (AFIP); and 6) STS-107 Crew Surgeon.
CASI
Accident Investigation; Aerospace Medicine; Lessons Learned; Space Transportation System; Columbia (Orbiter)

20080029208 NASA Johnson Space Center, Houston, TX, USA
Introduction and Mission Response Team (MRT)
Pool, Sam; Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation; May 09, 2005; In English; See also 20080029207; No Copyright; Available from CASI only as part of the entire parent document

On February 1, 2003 the Space Shuttle Columbia, returning to Earth with a crew of seven astronauts, disintegrated along a track extending from California to Louisiana. Observers on the ground filmed breakup of the spacecraft. Debris fell along a 567 statute mile track from Littlefield, Texas to Fort Polk, Louisiana; the largest ever recorded debris field. At the time of the accident the National Aeronautics and Space Administration (NASA) flight surgeon on-duty at the Mission Control Center (MCC) in Houston, Texas initiated the medical contingency response. The DOD surgeon at Patrick Air Force Base was notified, NASA medical personnel were recalled and the services of Armed Forces Institute of Pathology (AFIP) were requested. Subsequent to the accident the NASA flight surgeons that had supported the crew on orbit now provided medical

support to the crewmember s families. Federal Emergency Management Agency (FEMA), the National Transportation Safety Board (NTSB), the Federal Bureau of Investigation (FBI) and numerous other federal, state and local agencies along with the citizens of Texas and Louisiana responded to the disaster. Search and recovery was managed from a Disaster Field Office (DFO) established in Lufkin, Texas. Mishap Investigation Team (MIT) medical operations were managed from Barksdale Air Force Base, Louisiana. Accident investigation teams (Columbia Accident Investigation Task Force (CAITF) and Columbia Accident Investigation Board (CAIB)) appointed immediately after the disaster included current and former authorities in space medicine. In August 2003, the CAIB concluded its investigation and released its findings in a report published in February 2004.
Author
Safety Management; Accident Investigation; Aerospace Medicine; Emergencies; Medical Personnel; Crews; Disasters

20080029209 NASA Johnson Space Center, Houston, TX, USA
Primary Disaster Field Office (DFO), Lufkin, Texas
Wetherbee, James D.; Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation; May 09, 2005; In English; See also 20080029207; No Copyright; Available from CASI only as part of the entire parent document

On February 1, 2003, the Space Shuttle Columbia broke apart during atmospheric re-entry on mission STS-107; the complexity of such an event cannot be underestimated. The Lufkin Disaster Field Office (DFO) served as the primary DFO for all operations, including staging assets and deploying field teams for search, recovery and security. There were many organizations that had operational experience with disaster recovery. Offers to help came from many groups including the White House Liaison Office, the Department of Defense (DOD), branches of local, state and federal government, the Federal Bureau of Investigation (FBI), the Federal Emergency Management Agency (FEMA), the Environmental Protection Agency (EPA), state police, fire departments, the Texas Forestry Service, the Texas Army National Guard, medical groups, various rescue forces, contractor companies, the Salvation Army, local businesses, and citizens of our country and especially East Texas. The challenge was to know how much help to accept and how to efficiently incorporate their valuable assistance into a comprehensive and cohesive operational plan. There were more than 2,000 people involved with search and recovery.
Author
Defense Program; Disasters; Rescue Operations; Organizations; Forest Management; Environment Protection; Deployment; Emergencies

20080029210 Armed Forces Inst. of Pathology, Washington, DC, USA
Armed Forces Institute of Pathology (AFIP)
Mallak, Craig; Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation; May 09, 2005; In English; See also 20080029207; No Copyright; Available from CASI only as part of the entire parent document

The AFIP and NASA relationship was developed in an effort to appropriately respond to a space shuttle mishap. This briefing discusses the AFIP/NASA relationship with special emphasis being placed on search, recovery and identification activities
Author
Armed Forces; Pathology; Space Shuttles

20080029211 NASA Johnson Space Center, Houston, TX, USA
Mishap Investigation Team (MIT) - Barksdale AFB, Louisiana
Stepaniak, Philip; Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation; May 09, 2005; In English; See also 20080029207; No Copyright; Available from CASI only as part of the entire parent document

The Shuttle Program is organized to support a Shuttle mishap using the resources of the MIT. The afternoon of Feb. 1, 2003, the MIT deployed to Barksdale AFB. This location became the investigative center and interim storage location for crewmembers received from the Lufkin Disaster Field Office (DFO). Working under the leadership of the MIT Lead, the medical team executed a short-term plan that included search, recovery, and identification including coordination with the Armed Forces Institute of Pathology Temporary operations was set up at Barksdale Air Force Base for two weeks. During this time, coordination with the DFO field recovery teams, AFIP personnel, and the crew surgeons was on going. In addition, the crewmember families and NASA management were updated daily. The medical team also dealt with public reports and questions concerning biological and chemical hazards, which were coordinated with SPACEHAB, Inc., Kennedy Space Center (KSC) Medical Operations and the Johnson Space Center (JSC) Space Medicine office. After operations at Barksdale were

concluded the medical team transitioned back to Houston and a long-term search, recovery and identification plan was developed.
Author
Aerospace Medicine; Biological Hazards; Disasters; Deployment; Crews; Coordination; Medical Personnel; Surgeons; Teams

20080029212 NASA Johnson Space Center, Houston, TX, USA
STS-107 Crew Surgeon
Johnston, Smith; Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation; May 09, 2005; In English; See also 20080029207; No Copyright; Available from CASI only as part of the entire parent document

NASA Crew Surgeons (CS) provides medical support to crewmembers assigned to a space flight. Upon this mission assignment, CS s develop close working and personal relationships with crewmembers, their families and close friends. This discussion covers the role of the NASA CS from start of a mission assignment through its completion. Specific emphasis is placed on events associated with the Columbia accident to include; premission planning, initial family medical support, interface with the astronaut Casualty Assistance Control Officers (CACOs), AFIP relationship and on-going care for the families.
Author
Spacecrews; Surgeons; Space Transportation System; Astronauts

20080029213 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Kennedy Space Center (KSC) Mishap Response Plan
Scarpa, Philip; Aeromedical Lessons from the Space Shuttle Columbia Accident Investigation; May 09, 2005; In English; See also 20080029207; No Copyright; Available from CASI only as part of the entire parent document

KSC Medical Operations, in exercising the KSC Psychological Triage Plan, provided crewmember family support following notification of the Columbia accident. KSC Medical Operations also provided field support in working with FEMA and EPA to assure adequate occupational medicine and environmental health care of KSC workers. In addition, the development of policy and procedures for handling and clearing biohazardous debris material in the KSC reconstruction hangar was prepared and implemented.
Author
Medical Services; Policies; Disasters; Personnel; Crews; Debris

20080029280 NASA Johnson Space Center, Houston, TX, USA
STS-111 (OV-105 Flight 18) Meteoroid and Orbital Debris Post Flight Assessment
Hyde, James L.; Bernhard, Ronald P.; [2006]; 59 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNJ05HI05C
Report No.(s): JSC-62698; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080029280

STS-111 was the eighteenth flight for the Endeavour vehicle. The UF-2 mission to the International Space Station (ISS), involved a crew rotation and the delivery of new supplies and experiments in the Multi-Purpose Logistics Module (MPLM). The mission took place between the 5th and 19th of June 2002, with an orbital inclination of 51.6 and an altitude of about 389km (210 nautical miles). This report is divided into two sections. The As-Flown Assessment section compares the results of a risk analysis using post-flight attitude data with post-flight damage observations and pre-flight risk predictions. The Post-flight Damage Inspection section documents the meteoroid & orbital debris damage that was observed during inspections at KSC following the mission.
Derived from text
Meteoroids; Space Debris; Space Transportation System; Postflight Analysis

20080029370 NASA Johnson Space Center, Houston, TX, USA
Safety and Mission Assurance Knowledge Management Retention: Managing Knowledge for Successful Mission Operations
Johnson, Teresa A.; March 02, 2006; 1 pp.; In English; Managing Knowledge for Successful Mission OPS, 2-3 Mar. 2006, Houston, TX, USA
Contract(s)/Grant(s): 667560.05.02; No Copyright; Avail.: Other Sources; Abstract Only

Knowledge Management is a proactive pursuit for the future success of any large organization faced with the imminent

possibility that their senior managers/engineers with gained experiences and lessons learned plan to retire in the near term. Safety and Mission Assurance (S&MA) is proactively pursuing unique mechanism to ensure knowledge learned is retained and lessons learned captured and documented. Knowledge Capture Event/Activities/Management helps to provide a gateway between future retirees and our next generation of managers/engineers. S&MA hosted two Knowledge Capture Events during 2005 featuring three of its retiring fellows (Axel Larsen, Dave Whittle and Gary Johnson). The first Knowledge Capture Event February 24, 2005 focused on two Safety and Mission Assurance Safety Panels (Space Shuttle System Safety Review Panel (SSRP); Payload Safety Review Panel (PSRP) and the latter event December 15, 2005 featured lessons learned during Apollo, Skylab, and Space Shuttle which could be applicable in the newly created Crew Exploration Vehicle (CEV)/Constellation development program. Gemini, Apollo, Skylab and the Space Shuttle promised and delivered exciting human advances in space and benefits of space in people s everyday lives on earth. Johnson Space Center's Safety & Mission Assurance team work over the last 20 years has been mostly focused on operations we are now beginning the Exploration development program. S&MA will promote an atmosphere of knowledge sharing in its formal and informal cultures and work processes, and reward the open dissemination and sharing of information; we are asking 'Why embrace relearning the 'lessons learned' in the past?' On the Exploration program the focus will be on Design, Development, Test, & Evaluation (DDT&E); therefore, it is critical to understand the lessons from these past programs during the DDT&E phase.
Author
Space Missions; Information Management; Space Shuttles; Aerospace Safety; Lessons Learned

20080030926 NASA White Sands Test Facility, NM, USA
LOX, GOX and Pressure Relief
McLeod, Ken; Stoltzfus, Joel; May 2006; 49 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Oxygen relief systems present a serious fire hazard risk with often severe consequences. This presentation offers a risk management solution strategy which encourages minimizing ignition hazards, maximizing best materials, and utilizing good practices. Additionally, the relief system should be designed for cleanability and ballistic flow. The use of the right metals, softgoods, and lubricants, along with the best assembly techniques, is stressed. Materials should also be tested if data is not available and a full hazard analysis should be conducted in an effort to minimize risk and harm.
Derived from text
High Pressure Oxygen; Liquid Oxygen; Gas Pressure; Fires; Risk Assessment; Risk Management; Aerospace Safety

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*.

20080030264 NASA Johnson Space Center, Houston, TX, USA
UWB Tracking System Design for Lunar/Mars Exploration
Ni, Jianjun; Arndt, Dickey; Ngo, Phong; Phan, Chau; Gross, Julia; March 13, 2006; 6 pp.; In English; 1st International Conference on Wireless, 13-16 Mar. 2006, Sydney, Australia; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030264

This paper describes a design effort for a prototype ultra-wideband (UWB) tracking system that is currently under development at NASA Johnson Space Center (JSC). The system is being studied for use in tracking of lunar/Mars rovers during early exploration missions when satellite navigation systems are not available. The UWB technology is exploited to implement the tracking system due to its properties such as high data rate, fine time resolution, low power spectral density, and multipath immunity. A two-cluster prototype design using commercially available UWB products is proposed to implement the Angle Of Arrival (AOA) tracking methodology in this research effort. An AOA technique using the Time Difference Of Arrival (TDOA) information is utilized for location estimation in the prototype system, not only to exploit the precise time resolution possible with UWB signals, but also to eliminate the need for synchronization between the transmitter and the receiver. After the UWB radio at each cluster is used to obtain the TDOA estimates from the UWB signal sent from the target, the TDOA data is converted to AOA data to find the angle of arrival, assuming this is a far field application. Since the distance between two clusters is known, the target position is computed by a simple triangulation. Simulations show that the average tracking error at a range of 610 meters is 2.7595 meters, less than 0.5% of the tracking range. Outdoor tests to

track the SCOUT vehicle (The Science Crew Operations and Utility Testbed) near the Meteor Crater, Flagstaff, Arizona were performed on September 12-13, 2005. The tracking performance was obtained with less than 1% tracking error at ranges up to 2000 feet. No RF interference with on-board GPS, video, voice and telemetry systems was detected. Outdoor tests demonstrated the UWB tracking capability.
Author
Tracking Networks; Lunar Exploration; Satellite Navigation Systems; Global Positioning System; Lunar Roving Vehicles; Radio Frequencies; Broadband

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*.

20080026301 NASA Johnson Space Center, Houston, TX, USA
Abort Options for Human Lunar Missions between Earth Orbit and Lunar Vicinity
Condon, Gerald L.; Senent, Juan S.; Llama, Eduardo Garcia; January 22, 2005; 15 pp.; In English; 2006 AAS/AIAA Space Flight Mechanics Meeting, 22-26 Jan. 2005, Tampa, FL, USA; Original contains color and black and white illustrations
Report No.(s): AAS 06-115; Copyright; Avail.: CASI: A03, Hardcopy

Apollo mission design emphasized operational flexibility that supported premature return to Earth. However, that design was tailored to use expendable hardware for short expeditions to low-latitude sites and cannot be applied directly to an evolutionary program requiring long stay times at arbitrary sites. This work establishes abort performance requirements for representative onorbit phases of missions involving rendezvous in lunar-orbit, lunar-surface and at the Earth-Moon libration point. This study submits reference abort delta-V requirements and other Earth return data (e.g., entry speed, flight path angle) and also examines the effect of abort performance requirements on propulsive capability for selected vehicle configurations.
Author
Lunar Orbits; Mission Planning; Libration; Earth Orbits; Lunar Surface; Flight Paths

20080026302 NASA Johnson Space Center, Houston, TX, USA
Space Shuttle Thermal Protection System Repair Flight Experiment Induced Contamination Impacts
Smith, Kendall A.; Soares, Carlos E.; Mikatarian, Ron; Schmidl, Danny; Campbell, Colin; Koontz, Steven; Engle, Michael; McCroskey, Doug; Garrett, Jeff; January 09, 2006; 6 pp.; In English; 44th Aerospace Sciences Meeting, 9-12 Jan. 2006, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS15-10000; Copyright; Avail.: CASI: A02, Hardcopy

NASA s activities to prepare for Flight LF1 (STS-114) included development of a method to repair the Thermal Protection System (TPS) of the Orbiter s leading edge should it be damaged during ascent by impacts from foam, ice, etc . Reinforced Carbon-Carbon (RCC) is used for the leading edge TPS. The repair material that was developed is named Non- Oxide Adhesive eXperimental (NOAX). NOAX is an uncured adhesive material that acts as an ablative repair material. NOAX completes curing during the Orbiter s descent. The Thermal Protection System (TPS) Detailed Test Objective 848 (DTO 848) performed on Flight LF1 (STS-114) characterized the working life, porosity void size in a micro-gravity environment, and the on-orbit performance of the repairs to pre-damaged samples. DTO 848 is also scheduled for Flight ULF1.1 (STS-121) for further characterization of NOAX on-orbit performance. Due to the high material outgassing rates of the NOAX material and concerns with contamination impacts to optically sensitive surfaces, ASTM E 1559 outgassing tests were performed to determine NOAX condensable outgassing rates as a function of time and temperature. Sensitive surfaces of concern include the Extravehicular Mobility Unit (EMU) visor, cameras, and other sensors in proximity to the experiment during the initial time after application. This paper discusses NOAX outgassing characteristics, how the amount of deposition on optically sensitive surfaces while the NOAX is being manipulated on the pre-damaged RCC samples was determined by analysis, and how flight rules were developed to protect those optically sensitive surfaces from excessive contamination where necessary.
Author
Thermal Protection; Space Transportation System; Time Temperature Parameter; Ablative Materials; Carbon-Carbon Composites; Extravehicular Mobility Units; Microgravity; Leading Edges

20080026345 NASA Johnson Space Center, Houston, TX, USA

Fluid Quick Disconnects - ISS Lessons Learned

Bond, Timothy A.; Morrison, Russell H.; July 17, 2006; 1 pp.; In English; International Conference on Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA

Contract(s)/Grant(s): 401769; No Copyright; Avail.: Other Sources; Abstract Only

The International Space Station has many fluid systems on the USA On-orbit Segment supporting thermal control, life support, extravehicular activities and payloads. To facilitate assembly and maintenance, fluid quick disconnect (QD) fittings are used throughout these systems for both internal pressurized modules and for external systems exposed to space. In the years since full scale development began on these QDs, a number of design and performance issues have surfaced and required substantial program funds and activity to rectify. This paper is intended to describe the most significant of these issues, their resolutions, and the lessons learned from the ISS experience.

Author

Disconnect Devices; International Space Station; Modules; Fittings; Temperature Control; Life Support Systems; Lessons Learned

20080026346 NASA Johnson Space Center, Houston, TX, USA

Impact of Solar Array Position on ISS Vehicle Charging

Alred, John; Mikatarian, Ronald; Koontz, Steve; January 09, 2006; 16 pp.; In English; 44th AIAA Aerospace Sciences Meeting, 8-12 Jan. 2006, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS15-10000; Copyright; Avail.: CASI: A03, Hardcopy

The International Space Station (ISS), because of its large structure and high voltage solar arrays, has a complex plasma interaction with the ionosphere in low Earth orbit (LEO). This interaction of the ISS US Segment photovoltaic (PV) power system with the LEO ionospheric plasma produces floating potentials on conducting elements of the ISS structure relative to the local plasma environment. To control the ISS floating potentials, two Plasma Contactor Units (PCUs) are installed on the Z1 truss. Each PCU discharges accumulated electrons from the Space Station structure, thus reducing the potential difference between the ISS structure and the surrounding charged plasma environment. Operations of the PCUs were intended to keep the ISS floating potential to 40 Volts (Reference 1). Exposed dielectric surfaces overlying conducting structure on the Space Station will collect an opposite charge from the ionosphere as the ISS charges. In theory, when an Extravehicular Activity (EVA) crewmember is tethered to structure via the crew safety tether or when metallic surfaces of the Extravehicular Mobility Unit (EMU) come in contact with conducting metallic surfaces of the ISS, the EMU conducting components, including the perspiration-soaked crewmember inside, can become charged to the Space Station floating potential. The concern is the potential dielectric breakdown of anodized aluminum surfaces on the EMU producing an arc from the EMU to the ambient plasma, or nearby ISS structure. If the EMU arcs, an electrical current of an unknown magnitude and duration may conduct through the EVA crewmember, producing an unacceptable condition. This electrical current may be sufficient to startle or fatally shock the EVA crewmember (Reference 2). Hence, as currently defined by the EVA community, the ISS floating potential for all nominal and contingency EVA worksites and translation paths must have a magnitude less than 40 volts relative to the local ionosphere at all times during EVA. Arcing from the EMU is classified as a catastrophic hazard, which requires two-failure tolerant controls, i.e., three hazard controls. Each PCU is capable of maintaining the ISS floating potential below the requirement during EVA. The two PCUs provide a single failure tolerant control of ISS floating potential. In the event of the failure of one or two PCUs, a combination of solar array shunting and turning the solar arrays into their own wakes will be used to supply control of the plasma hazard (Reference 3). The purpose of this paper is to present on-orbit information that shows that ISS solar array placement with respect to the ISS velocity vector can control solar array plasma charging, and hence, provide an operational control for the plasma hazard. Also, this paper will present on-orbit information that shows that shunting of the ISS solar arrays can control solar array plasma charging, and hence, provide an additional operational control for the plasma hazard.

Author

Solar Arrays; Dielectrics; Low Earth Orbits; Space Station Structures; Plasma Potentials; International Space Station; Extravehicular Activity; Fault Tolerance; High Voltages

20080026347 NASA Johnson Space Center, Houston, TX, USA

Analysis of ISS Plasma Interaction

Reddell, Brandon; Alred, John; Kramer, Leonard; Mikatarian, Ron; Minow, Joe; Koontz, Steve; January 09, 2006; 16 pp.; In English; 44th AIAA Aerospace Sciences Meeting, 9-12 Jan. 2006, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS15-10000; Copyright; Avail.: CASI: A03, Hardcopy

To date, the International Space Station (ISS) has been one of the largest objects flown in lower earth orbit (LEO). The ISS utilizes high voltage solar arrays (160V) that are negatively grounded leading to pressurized elements that can float negatively with respect to the plasma. Because laboratory measurements indicate a dielectric breakdown potential difference of 80V, arcing could occur on the ISS structure. To overcome the possibility of arcing and clamp the potential of the structure, two Plasma Contactor Units (PCUs) were designed, built, and flown. Also a limited amount of measurements of the floating potential for the present ISS configuration were made by a Floating Potential Probe (FPP), indicating a minimum potential of 24 Volts at the measurement location. A predictive tool, the ISS Plasma Interaction Model (PIM) has been developed accounting for the solar array electron collection, solar array mast wire and effective conductive area on the structure. The model has been used for predictions of the present ISS configuration. The conductive area has been inferred based on available floating potential measurements. Analysis of FPP and PCU data indicated distribution of the conductive area along the Russian segment of the ISS structure. A significant input to PIM is the plasma environment. The International Reference Ionosphere (IRI 2001) was initially used to obtain plasma temperature and density values. However, IRI provides mean parameters, leading to difficulties in interpretation of on-orbit data, especially at eclipse exit where maximum charging can occur. This limits our predicative capability. Satellite and Incoherent Scatter Radar (ISR) data of plasma parameters have also been collected. Approximately 130,000 electron temperature (Te) and density (Ne) pairs for typical ISS eclipse exit conditions have been extracted from the reduced Langmuir probe data flown aboard the NASA DE-2 satellite. Additionally, another 18,000 Te and Ne pairs of ISR data from several radar locations around the globe were used to assure consistency of the satellite data. PIM predictions for ISS charging made with this data correlated very well with FPP data, indicating that the general physics of spacecraft charging with high voltage solar arrays have been captured. The predictions also provided the probabilities of occurrences for ISS charging. These probabilities give a numerical measure of the number of times when the ISS will approach or exceed the vehicle plasma hazard conditions for each configuration. In this paper we shall present the interaction mechanisms between the ISS and the surrounding plasma and give an overview of the PIM components. PIM predictions are compared with available data followed by a discussion of the variability of plasma parameters and the conductive area on the ISS. The ISS PIM will be further tested and verified as data from the Floating Potential Measurement Unit become available, and construction of the ISS continues.

Author

International Space Station; Dielectrics; Plasmas (Physics); Spacecraft Charging; Earth Ionosphere; Low Earth Orbits; Incoherent Scatter Radar; High Voltages; Solar Arrays

20080026348 NASA Johnson Space Center, Houston, TX, USA

BLIMPK/Streamline Surface Catalytic Heating Predictions on the Space Shuttle Orbiter

Marichalar, Jeremiah J.; Rochelle, William C.; Kirk, Benjamin S.; Campbell, Charles H.; January 09, 2006; 21 pp.; In English; 44th AIAA Aerospace Sciences Meeting, 9-12 Jan. 2006, Reno, NV, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 377816.06.02.05.03.05.04; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes the results of an analysis of localized catalytic heating effects to the U.S. Space Shuttle Orbiter Thermal Protection System (TPS). The analysis applies to the High-temperature Reusable Surface Insulation (HRSI) on the lower fuselage and wing acreage, as well as the critical Reinforced Carbon-Carbon on the nose cap, chin panel and the wing leading edge. The object of the analysis was to use a modified two-layer approach to predict the catalytic heating effects on the Orbiter windward HRSI tile acreage, nose cap, and wing leading edge assuming localized highly catalytic or fully catalytic surfaces. The method incorporated the Boundary Layer Integral Matrix Procedure Kinetic (BLIMPK) code with streamline inputs from viscous Navier-Stokes solutions to produce heating rates for localized fully catalytic and highly catalytic surfaces as well as for nominal partially catalytic surfaces (either Reinforced Carbon-Carbon or Reaction Cured Glass) with temperature-dependent recombination coefficients. The highly catalytic heating results showed very good correlation with Orbiter Experiments STS-2, -3, and -5 centerline and STS-5 wing flight data for the HRSI tiles. Recommended catalytic heating factors were generated for use in future Shuttle missions in the event of quick-time analysis of damaged or repaired

TPS areas during atmospheric reentry. The catalytic factors are presented along the streamlines as well as a function of stagnation enthalpy so they can be used for arbitrary trajectories.
Author
Temperature Effects; Thermal Protection; Space Shuttle Orbiters; Carbon-Carbon Composites; Atmospheric Entry

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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*.

20080030347 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Assessment of MODIS Scan Mirror Reflectance Changes On-Orbit
Xiong, Xiaoxiong; Wu, A.; Angal, A.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Since launch, the NASA EOS Terra and Aqua MODIS have operated successfully for more than 8 and 6 years, respectively. MODIS collects data using a two-sided scan mirror over a large scan angular range. The scan mirror is made of a polished, nickel-plated beryllium base coated with high purity silver, which is then over-coated with the Denton proprietary silicon monoxide and silicon dioxide mixture. The scan mirror's reflectance was characterized pre-launch using its witness samples, and the response versus scan angle was measured at the sensor system level. In this study, we present an assessment of MODIS scan mirror on-orbit degradation by examining changes of spectral band response over each sensor's mission lifetime. Results show that the scan mirror's optical properties for both Terra and Aqua MODIS have experienced significant degradation since launch in the VIS spectral region, which is mirror side dependent as well as scan angle dependent. In general, the mirror degradation is more severe for Terra MODIS than Aqua MODIS, especially during recent years. For Terra MODIS, the degradation rate is noticeably different between the mirror sides. On the other hand, there has been little mirror side dependent difference for Aqua MODIS.
Author
MODIS (Radiometry); Mirrors; Reflectance; Degradation; Data Acquisition; Optical Properties

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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*.

20080026247 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA's In Space Propulsion Technology Program Accomplishments and Lessons Learned
Johnson, Les C.; Harris, David; March 26, 2008; 1 pp.; In English; Tennessee Valey Emerging Technology Conference, 26-28 Mar. 2008, Huntsville, AL, USA; No Copyright; Avail.: Other Sources; Abstract Only

NASA's In-Space Propulsion Technology (ISPT) Program was managed for 5 years at the NASA MSFC and significant strides were made in the advancement of key transportation technologies that will enable or enhance future robotic science and deep space exploration missions. At the program's inception, a set of technology investment priorities were established using an NASA-wide, mission-driven prioritization process and, for the most part, these priorities changed little - thus allowing a consistent framework in which to fund and manage technology development. Technologies in the portfolio included aerocapture, advanced chemical propulsion, solar electric propulsion, solar sail propulsion, electrodynamic and momentum transfer tethers, and various very advanced propulsion technologies with significantly lower technology readiness. The program invested in technologies that have the potential to revolutionize the robotic exploration of deep space. For robotic exploration and science missions, increased efficiencies of future propulsion systems are critical to reduce overall life-cycle costs and, in some cases, enable missions previously considered impossible. Continued reliance on conventional chemical propulsion alone will not enable the robust exploration of deep space - the maximum theoretical efficiencies have almost been reached and they are insufficient to meet needs for many ambitious science missions currently being considered. By developing the capability to support mid-term robotic mission needs, the program was to lay the technological foundation for travel to nearby interstellar space. The ambitious goals of the program at its inception included supporting the development

of technologies that could support all of NASA's missions, both human and robotic. As time went on and budgets were never as high as planned, the scope of the program was reduced almost every year, forcing the elimination of not only the broader goals of the initial program, but also of funding for over half of the technologies in the original portfolio. In addition, the frequency at which the application requirements for the program changed exceeded the development time required to mature technologies: forcing sometimes radical rescoping of research efforts already halfway (or more) to completion. At the end of its fifth year, both the scope and funding of the program were at a minimum despite the program successfully meeting all of it's initial high priority objectives. This paper will describe the program, its requirements, technology portfolio, and technology maturation processes. Also discussed will be the major technology milestones achieved and the lessons learned from managing a $100M+ technology program.
Author
Lessons Learned; Technology Assessment; NASA Space Programs; Space Missions; Spacecraft Propulsion

20080029255 Wright Lab., Wright-Patterson AFB, OH, USA
Scramjet Propulsion
Stull, F.; July 20, 1989; 13 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 89-5012; Copyright; Avail.: CASI: A03, Hardcopy

The performance goals of the NASP program require an aero-propulsion system with a high effective specific impulse, in order to achieve these goals, it is essential that the high potential performance of airbreathing engines be achieved over a very wide Mach number operating range. This, in turn, demands high component performance and involves many important technical issues which must be resolved. These key technical issues are shown in the accompanying figure. Scramjet Propulsion Technology is divided into five major areas: (1) inlets, (2) Combustors, (3) Nozzles, (4) Component Integration, and (5) Test Facilities, Critical areas of focus for the component areas (inlets, combustors, and nozzles) are the resolution of key technical issues, development of a high Mach number design methodology, and establishment of a high Mach number performance data base that will meet the challenging goals of the high performance and minimum weight engine required for NASP. In component integration, it is essential to test integrated models of selected component designs in order to resolve component integration problems and to evaluate overall engine performance. Test facilities are required (1) to provide Mach 5-8 test capabilities of sufficient scale in order to conduct and support the engine contractors' propulsion module tests and (2) to provide very high Mach number simulations for smaller scale component tests.
Author
National Aerospace Plane Program; Spacecraft Propulsion; Supersonic Combustion Ramjet Engines; Technology Utilization

20080030375 NASA Langley Research Center, Hampton, VA, USA
Design of a Mars Airplane Propulsion System for the Aerial Regional-Scale Environmental Survey (ARES) Mission Concept
Kuhl, Christopher A.; July 20, 2008; 18 pp.; In English; 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, 20-23 Jul. 2008, Hartford, CT, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 698671.02.07.02.01; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030375

The Aerial Regional-Scale Environmental Survey (ARES) is a Mars exploration mission concept that utilizes a rocket propelled airplane to take scientific measurements of atmospheric, surface, and subsurface phenomena. The liquid rocket propulsion system design has matured through several design cycles and trade studies since the inception of the ARES concept in 2002. This paper describes the process of selecting a bipropellant system over other propulsion system options, and provides details on the rocket system design, thrusters, propellant tank and PMD design, propellant isolation, and flow control hardware. The paper also summarizes computer model results of thruster plume interactions and simulated flight performance. The airplane has a 6.25 m wingspan with a total wet mass of 185 kg and has to ability to fly over 600 km through the atmosphere of Mars with 45 kg of MMH / MON3 propellant.
Author
Liquid Rocket Propellants; Flight Characteristics; Rocket Engines; Mars Atmosphere; Mars Exploration; Systems Engineering; Computerized Simulation

20080030438 Naval Postgraduate School, Monterey, CA USA

Flow Study of a Novel Ionizer Configuration with Testing Apparatus

Armstrong, John D; Mar 2008; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479818; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479818

Micro-satellites require a propulsion system that minimizes mass and size while maximizing performance. Ion propulsion engines may be the most scalable pending reductions in ionizer size. This work explores a new ionization chamber concept. This thesis reports on the ionization of Argon, an alternative propellant to Xenon, which has been achieved at relatively low voltages with locally designed and manufactured Micro-Structured Electrode (MSE) Arrays. Testing was done with the gas flowing through the array holes, simulating the actual space environment as in an operating ion thruster. With argon flowing, breakdown has been achieved at voltages between 230 and 350 volts depending on chamber pressure, and array insulation thickness and hole size. The breakdown voltage in argon gas was higher (between 15 and 100 volts) with the flow than that without for the same wafer, and always higher for the smaller (0.127 mm vs. 0.381 mm) insulation thickness tested. No breakdown was observed when the cathode was located upstream.

DTIC

Ion Engines; Ionizers

20080030456 Army Tank-Automotive Research and Development Command, Warren, MI USA

Motion Base Simulation of a Hybrid-Electric HMMWV for Fuel Economy Measurement

Brudnak, Mark; Pozolo, Mike; McGough, Matthew; Mortsfield, Todd; Shvartsman, Andrey; Romano, Richard; Apr 2008; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479845; RDECOM/TARDEC-TR-18816; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479845

Determine the fuel economy benefits of hybrid electric vehicles using quantifiable test data. Assess the ability of modeling and simulation tools to measure fuel economy. A conventional and a hybrid electric HMMWV was used for this experiment.

DTIC

Electric Propulsion; Fuel Consumption; Mobility; Motion Simulation; Simulation

20080030940 NASA Lewis Research Center, Cleveland, OH, USA

Fueling the National Aero-Space Plane with Slush Hydrogen

Hannum, Ned P.; Berkopec, Frank D.; July 20, 1989; 13 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper 89-5014; Copyright; Avail.: CASI: A03, Hardcopy

The National Aerospace Plane is a horizontal take off and landing, single stage-to-orbit vehicle using hydrogen as the fuel. The first flights are planned for the mid 1990's. The high heating value, cooling capacity, and combustion properties make hydrogen the fuel of choice, but the low density results in a large vehicle. Both the fuel cooling capacity and density are increased with the use of slush hydrogen and result in significant reductions in size of the vehicle. A national program to advance this technology and to find engineering solutions to the many design issues is now underway.

Author

Hydrogen Fuels; National Aerospace Plane Program; Slush Hydrogen; Spacecraft Propulsion

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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*.

20080026314 Westinghouse Savannah River Co., Aiken, SC, USA

Application of Polyurethane Foam for Impact Absorption and Thermal Insulation for Radioactive Materials Packagings

Smith, A. C.; Abramczyk, G. A.; Bellamy, J. S.; Blanton, P. S.; Daugherty, W. L.; January 2007; 8 pp.; In English

Report No.(s): DE2007-913133; WSRC-STI-2007-00444; No Copyright; Avail.: Department of Energy Information Bridge

Polyurethane foam has been widely used as an impact absorbing and thermal insulating material for large radioactive

materials packages, since the 1980s. With the adoption of the regulatory crush test requirement, for smaller packages, polyurethane foam has been adopted as a replacement for cane fiberboard, because of its ability to withstand the crush test. Polyurethane foam is an engineered material whose composition is much more closely controlled than that of cane fiberboard. In addition, the properties of the foam can be controlled by controlling the density of the foam. The conditions under which the foam is formed, whether confined or unconfined have an affect on foam properties. The study reported here reviewed the application of polyurethane foam in RAM packagings and compared property values reported in the literature with published property values and test results for foam specimens taken from a prototype 9977 packaging. The study confirmed that, polyurethane foam behaves in a predictable and consistent manner and fully satisfies the functional requirements for impact absorption and thermal insulation.
NTIS
Packaging; Polyurethane Foam; Thermal Insulation; Impact Resistance; Impact Tolerances

20080026326 Watkins (Kenneth S.), Dahlonega, GA, USA
Electrical Condition Monitoring Method for Polymers
Watkins, K. S., Inventor; Morris, S. J., Inventor; Masakowski, D. D., Inventor; Wong, C. P., Inventor; 5 Mar 03; 14 pp.; In English
Patent Info.: Filed Filed 5 Mar 03; US-Patent-Appl-SN-10-506-518
Report No.(s): PB2007-110518; No Copyright; Avail.: CASI: A03, Hardcopy

An electrical condition monitoring method utilizes measurements of electrical resistivity of an age sensor (303) made of a conductive matrix or composite disposed in a polymeric structure such as an electrical cable (301). The conductive matrix comprises a base polymer and conductive filler. The method comprises a means for communicating the resistivity to a measuring instrument (317) as a means to correlate resistivity of the conductive matrix of the polymeric structure with resistivity of an accelerated-aged conductive composite.
NTIS
Patent Applications; Power Lines

20080026328 Air Liquide, Houston, TX, USA
Novel Polyimide Based Mixed Matrix Membranes
Kulkarni, S. S., Inventor; Hasse, D. J., Inventor; 28 Mar 05; 13 pp.; In English
Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-091-682
Report No.(s): PB2007-110517; No Copyright; Avail.: CASI: A03, Hardcopy

This abstract discusses producing mixed matrix composite (MMC) membranes using polyimide polymers. Polyimide MMC membranes of the current invention are particularly useful for the production of oxygen-enriched air or nitrogen-enriched-air, for the separation of carbon dioxide from hydrocarbons or nitrogen, and the separation of helium from various streams. Membranes of polyimide polymers, such as polyimide polymers sold under the tradename P-84, are mixed with molecular sieve materials, such as SSZ-13, to make MMC membranes. The MMC membranes of the invention provide improved membrane performance compared to polymer only membranes, particularly when used to form asymmetric film membranes. The MMC films exhibit consistent permeation performance as dense film or asymmetric film membranes, and do not interact with components of the process streams, such as organic solvents. The membranes of the invention exhibit particularly surprisingly good selectivity for the fluids of interest.
NTIS
Membranes; Patent Applications; Polyimides

20080029311 Nexant, Inc., White Plains, NY, USA
Dwory SA Styrene Monomer and Polystyrene Capacity Expansion Project. Volume 2 - Technical (Public Version)
Feb. 2006; 70 pp.; In English
Report No.(s): PB2007-113671; No Copyright; Avail.: CASI: A04, Hardcopy

One of Dwory's primary objectives is to increase its synthetic rubber production from 80 KTA to 120 KTY, improving operating efficiency while increasing capacity. The synthetic rubber capacity expansion is needed to maintain Dwory's market share in the tire and rubber industry by adding solution styrene-butadiene rubber (sSBR) capacity. The latter will complement Dwory's product range and maintain profitability. After examination of marketing prospects and potential suppliers of the technology, which was executed by the Nexant consultants with TDA grant support, it is now imperative to add a detailed analysis of the optimal method to implement new investment to enable this favorably reviewed project. However, in order to

successfully implement such a plant at the investment returns suggested in the previous TDA study, it will be necessary to have accessible additional rubber feedstock (butadiene and styrene).
NTIS
Industries; Monomers; Polystyrene; Rubber; Styrenes

20080029355 International Trade Commission, Washington, DC USA
Laminated Woven Sacks from China. Investigation Nos. 701-TA-450 and 731-TA-1122 (Preliminary)
Aug. 2007; 132 pp.; In English
Report No.(s): PB2007-113260; USITC/PUB-3942; No Copyright; Avail.: CASI: A07, Hardcopy

On June 28, 2007, a petition was filed with the Commission and Commerce by the Laminated Woven Sacks Committee, an ad hoc committee composed of five U.S. producers of laminated woven sacks, alleging that the establishment of an industry in the USA is materially retarded, or that an industry in the USA is materially injured or threatened with material injury by reason of LTFV and subsidized imports of laminated woven sacks from China. Members of the Laminated Woven Sacks Committee include: (1) Bancroft Bag, Inc. of West Monroe, LA; (2) Coating Excellence International, LLC of Wrightstown, WI; (3) Hood Packaging Corp. of Madison, MS; (4) Mid-America Packaging, LLC of Twinsburg, OH; and (5) Polytex Fibers Corp. of Houston, TX. Accordingly, effective June 28, 2007, the Commission instituted antidumping and countervailing duty investigation Nos. 701-TA-450 and 731- TA-1122 (Preliminary). Notice of the institution of the Commission's investigations and of a public conference to be held in connection therewith was given by posting copies of the notice in the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and by publishing the notice in the Federal Register of July 5, 2007 (72 FR 36720). The conference was held in Washington, DC, on July 19, 2007, and all persons who requested the opportunity were permitted to appear in person or by counsel.
NTIS
Bags; China; International Trade; Laminates; Packaging

20080029356 Geological Survey, Reston, VA USA
Mineral Commodity Summaries, 2006
January 2006; 202 pp.; In English
Report No.(s): PB2007-113802; No Copyright; Avail.: CASI: A10, Hardcopy

Each chapter of the 2006 edition of the U.S. Geological Survey (USGS) Mineral Commodity Summaries (MCS) includes information on events, trends, and issues for each mineral commodity as well as discussions and tabular presentations on domestic industry structure, Government programs, tariffs, 5-year salient statistics, and world production and resources. The MCS is the earliest comprehensive source of 2005 mineral production data for the world. More than 90 individual minerals and materials are covered by 2-page synopses. The principal sources for the reserves and reserve base information provided for most mineral commodities are trade journals and Government reports from Australia, Brazil, Canada, Chile, China, Germany, India, Japan, Mexico, Morocco, Peru, South Africa, the UK, and the USA. The Significant Events, Trends, and Issues section is an overview of domestic and international events affecting minerals that are important to the U.S. economy. Of particular note in 2005 was the increase in value of about 13% compared with that of 2004 for minerals and mineral materials mined in the USA. Asian economies grew rapidly (Chinas increase in gross domestic product was estimated at about 9% and Indias was just over 7%) and played increasingly important roles as both producers and consumers of minerals and materials. Many mineral-producing companies reported significant profits, owing to near-record prices for some metals as well as increased production for many mineral commodities. Worldwide expenditures for exploration for nonferrous metals were expected to surpass $5 billion, close to the previous nominal peak of $5.2 billion in 1997. The year began and ended with natural disasters (the tsunami in Southeast Asia and hurricanes in the U.S. Gulf Coast region) that had damaging effects on mineral operations and transportation facilities, and placed increased demands on production of mineral raw materials needed for reconstruction.
NTIS
Commodities; Economics; Industries; Minerals

20080029396 NASA White Sands Test Facility, NM, USA
Hydrogen and Storage Initiatives at the NASA JSC White Sands Test Facility
Maes, Miguel; Woods, Stephen S.; April 05, 2006; 30 pp.; In English; Hydrogen Initiative Symposium, 5-6 Apr. 2006, West Lafayette, IN, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

NASA WSTF Hydrogen Activities: a) Aerospace Test; b) System Certification & Verification; c) Component, System, &

Facility Hazard Assessment; d) Safety Training Technical Transfer: a) Development of Voluntary Consensus Standards and Practices; b) Support of National Hydrogen Infrastructure Development.
Derived from text
Hydrogen; Hazards; Procedures; Certification

20080030211 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The GEOS Chemistry Climate Model: Implications of Climate Feedbacks on Ozone Depletion and Recovery
Stolarski, Richard S.; Pawson, Steven; Douglass, Anne R.; Newman, Paul A.; Kawa, S. Randy; Nielsen, J. Eric; Rodriquez, Jose; Strahan, Susan; Oman, Luke; Waugh, Darryn; June 30, 2008; 1 pp.; In English; Wuadrennial Ozone Symposium, 30 Jun. - 5 Jul. 2008, Roomso, Norway; Copyright; Avail.: Other Sources; Abstract Only

The Goddard Earth Observing System Chemistry Climate Model (GEOS CCM) has been developed by combining the atmospheric chemistry and transport modules developed over the years at Goddard and the GEOS general circulation model, also developed at Goddard. The first version of the model was used in the CCMVal intercomparison exercises that contributed to the 2006 WMO/UNEP Ozone Assessment. The second version incorporates the updated version of the GCM (GEOS 5) and will be used for the next round of CCMVal evaluations and the 2010 Ozone Assessment. The third version, now under development, incorporates the combined stratosphere and troposphere chemistry package developed under the Global Modeling Initiative (GMI). We will show comparison to past observations that indicate that we represent the ozone trends over the past 30 years. We will also show the basic temperature, composition, and dynamical structure of the simulations. We will further show projections into the future. We will show results from an ensemble of transient and time-slice simulations, including simulations with fixed 1960 chlorine, simulations with a best guess scenario (Al), and simulations with extremely high chlorine loadings. We will discuss planned extensions of the model to include emission-based boundary conditions for both anthropogenic and biogenic compounds.
Author
Climate Models; Atmospheric General Circulation Models; Atmospheric Chemistry; Earth Observing System (EOS); Ozone Depletion; Troposphere; Stratosphere; Boundary Conditions

20080030401 Shaw Environmental, Inc., Lawrenceville, NJ USA
ER-1422: Biodegradation of 1,4-Dioxane
Steffan, Robert J; McClay, Kevin R,; Masuda, Hisako; Zylstra, Gerben J; Aug 2007; 118 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W912HQ-04-C-0041
Report No.(s): AD-A479704; CU-1422; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479704

The specific goals of this project were: 1) to evaluate biodegradation of 1,4-dioxane in environmental samples under different redox and chemical/physical conditions and different treatment regimes; 2) identify and isolate new 1,4-dioxane degrading microbes from environmental microcosms; 3) identify the products of 1,4-dioxane biodegradation by studying degradation pathways in pure bacterial cultures; 4) confirm that the same biodegradation pathways occur in active environmental samples; and 5) identify and evaluate genes involved in 1,4-dioxane biodegradation Biodegradation of 1,4-dioxane in environmental samples was performed by utilizing microcosms constructed with samples from two hydrogeochemically different 1,4-dioxane-contaminated aquifers. The 1,4-dioxane biodegradation pathways were determined by elucidating 1,4-dioxane degradation products produced by bacterial strains ENV425, ENV473, and ENV478.
DTIC
Biodegradation; Ethers

20080030845 Air Force Research Lab., Eglin AFB, FL USA; Purdue Univ., West Lafayette, IN, USA
Moisture Effects on the High Strain-Rate Behavior of Sand (Preprint)
Martin, Bradley E; Akers, Stephen A; Chen, Weinong; Song, Bo; Apr 2008; 31 pp.; In English
Contract(s)/Grant(s): Proj-2502
Report No.(s): AD-A479918; AFRL-RW-EG-TP-2008-7405; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479918

The effects of moisture content on the high strain rate mechanical properties of fine grain sand were characterized with a split-Hopkinson pressure bar. A controlled loading pulse allowed the sample to acquire stress equilibrium and a constant

strain-rate of 400 s(exp -1). The sand specimen confined in a hardened steel tube, had a dry density of 1/50 g/cm(exp 3) with moisture contents varied from 3% to 20% by weight. Experimental results indicate that partially saturated sand is more compressible than dry sand with the softest behavior observed at 7% moisture content. The softening of the partially saturated sand may occur due to the pore water acting as a lubricant between the sand particles. Similar trends were reported in the quasi-static regime for experiments conducted at comparable specimen conditions.
DTIC
Moisture; Moisture Content; Sands; Strain Rate

20080030848 Applied Research Associates, Inc., Tyndall AFB, FL USA
MIL SPEC 28 Square Foot Fire Burnback and Extinguishment Testing of FireAde, FlameOut II and Hawk ALLFIRE
Barrett, Kimberly D; Kalberer, Jennifer L; Jan 2008; 10 pp.; In English
Contract(s)/Grant(s): F08637-03-C-6015; Proj-GOVT
Report No.(s): AD-A479808; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479808

The Air Force, in cooperation with the Federal Aviation Administration, is screening new fire fighting foam concentrates to determine their effectiveness at extinguishing and resisting burnback for hydrocarbon fuel fires. This report documents the evaluation performed on the fire extinguishing agents FireAde 2000 AFFF LP, FlameOut II and Hawk ALLFORE in accordance with the parameters set forth in Military Specification (MIL SPEC) MIL-F-0024385F, Section 4.7.13 for the twenty-eight-square-foot fire test using three percent of Type 3 foam (normal concentration). Under the MIL SPEC test protocol, agents were required to meet a maximum extinguishment time of 30 seconds and a minimum burnback time of 360 seconds for normal concentrations. None of the three agents tested at the normal concentration met these minimum requirements. Although not part of the Air Force Research Lab protocol, additional tests were performed on FireAde at the lean concentration (1-1/2 percent). FireAde successfully passed this portion of the fire test. Lean concentration testing was not performed on the FlameOut II or Hawk ALLFORE foams.
DTIC
Fire Extinguishers; Fires; Flameout; Foaming; Hydrocarbon Fuels; Inhibitors

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COMPOSITE MATERIALS

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

20080029313 California Univ., Berkeley, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Composite-Wall Radiation-Shielded Cask and Method of Assembly
Fischer, L. E., Inventor; Mok, G. C., Inventor; 29 Jun 04; 15 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 29 Jun 04; US-Patent-Appl-SN-10-881-999
Report No.(s): PB2007-110119; No Copyright; Avail.: CASI: A03, Hardcopy

A composite-wall radiation-shielded cask and method of assembly having an inner shell surrounding a containment volume, and two or more non-annular sections of a radiation-shielding material secured with a fastener or strap to the inner shell to form a bound inner assembly. The bound inner assembly is inserted into an outer shell to form a clearance gap between the inner assembly and the outer shell. And the clearance gap is then filled with filler material capable of transferring mechanical and thermal loads between the bound inner assembly and the outer shell.
NTIS
Barrels (Containers); Patent Applications; Spent Fuels

20080029987 NASA Johnson Space Center, Houston, TX, USA
A Theoretical Investigation of Composite Overwrapped Pressure Vessel (COPV) Mechanics Applied to NASA Full Scale Tests
Greene, N.; Thesken, J. C.; Murthy, P. L. N.; Phoenix, S. L.; Palko, J.; Eldridge, J.; Sutter, J.; Saulsberry, R.; Beeson, H.; September 17, 2006; 21 pp.; In English; American Society for Composites - 20th Technical Conference, 17-20 Sep. 2006, Dearborn, MI, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080029987

A theoretical investigation of the factors controlling the stress rupture life of the National Aeronautics and Space Agency's

(NASA) composite overwrapped pressure vessels (COPVs) continues. Kevlar(TradeMark) fiber overwrapped tanks are of particular concern due to their long usage and the poorly understood stress rupture process in Kevlar(TradeMark) filaments. Existing long term data show that the rupture process is a function of stress, temperature and time. However, due to the presence of a load sharing liner, the manufacturing induced residual stresses and the complex mechanical response, the state of actual fiber stress in flight hardware and test articles is not clearly known. This paper is a companion to the experimental investigation reported in [1] and develops a theoretical framework necessary to design full-scale pathfinder experiments and accurately interpret the experimentally observed deformation and failure mechanisms leading up to static burst in COPVs. The fundamental mechanical response of COPVs is described using linear elasticity and thin shell theory and discussed in comparison to existing experimental observations. These comparisons reveal discrepancies between physical data and the current analytical results and suggest that the vessel's residual stress state and the spatial stress distribution as a function of pressure may be completely different from predictions based upon existing linear elastic analyses. The 3D elasticity of transversely isotropic spherical shells demonstrates that an overly compliant transverse stiffness relative to membrane stiffness can account for some of this by shifting a thin shell problem well into the realm of thick shell response. The use of calibration procedures are demonstrated as calibrated thin shell model results and finite element results are shown to be in good agreement with the experimental results. The successes reported here have lead to continuing work with full scale testing of larger NASA COPV hardware.

Author

Composite Wrapping; Pressure Vessels; Creep Rupture Strength; Kevlar (Trademark); Residual Stress; Deformation; Fatigue Life

20080030261 NASA Johnson Space Center, Houston, TX, USA

Nanomaterials for Space Exploration Applications

Moloney, Padraig G.; February 10, 2006; 40 pp.; In English; AIAA 'Launch-and-Learn', 10 Feb. 2006, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030261

Nano-engineered materials are multi-functional materials with superior mechanical, thermal and electrical properties. Nanomaterials may be used for a variety of space exploration applications, including ultracapacitors, active/passive thermal management materials, and nanofiltration for water recovery. Additional applications include electrical power/energy storage systems, hybrid systems power generation, advanced proton exchange membrane fuel cells, and air revitalization. The need for nanomaterials and their growth, characterization, processing and space exploration applications is discussed. Data is presented for developing solid-supported amine adsorbents based on carbon nanotube materials and functionalization of nanomaterials is examined.

Derived from text

Nanotechnology; Space Exploration; Technology Utilization; Aerospace Engineering; Nanocomposites

20080030371 NASA Langley Research Center, Hampton, VA, USA

Modeling the Non-Linear Response of Fiber-Reinforced Laminates Using a Combined Damage/Plasticity Model

Schuecker, Clara; Davila, Carlos G.; Pettermann, Heinz E.; July 2008; 29 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-2008-215314; L-19487; Copyright; Avail.: CASI: A03, Hardcopy

The present work is concerned with modeling the non-linear response of fiber reinforced polymer laminates. Recent experimental data suggests that the non-linearity is not only caused by matrix cracking but also by matrix plasticity due to shear stresses. To capture the effects of those two mechanisms, a model combining a plasticity formulation with continuum damage has been developed to simulate the non-linear response of laminates under plane stress states. The model is used to compare the predicted behavior of various laminate lay-ups to experimental data from the literature by looking at the degradation of axial modulus and Poisson s ratio of the laminates. The influence of residual curing stresses and in-situ effect on the predicted response is also investigated. It is shown that predictions of the combined damage/plasticity model, in general, correlate well with the experimental data. The test data shows that there are two different mechanisms that can have opposite effects on the degradation of the laminate Poisson s ratio which is captured correctly by the damage/plasticity model. Residual curing stresses are found to have a minor influence on the predicted response for the cases considered here. Some open questions remain regarding the prediction of damage onset.

Author

Fiber Composites; Capture Effect; Residual Stress; Shear Stress; Degradation; Laminates; Plastic Properties

20080030769 National Aero-Space Plane Joint Program Office, Wright-Patterson AFB, OH, USA

Materials Challenges for NASP

Ronald, Terence M. F.; July 20, 1989; 8 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA

Report No.(s): AIAA Paper 89-5010; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030769; http://www.aiaa.org/content.cfm?pageid=406

The structural designs for the NASP airframe and engines call for lightweight materials that can retain usable physical and mechanical properties to temperatures beyond those available today. In many cases, the structures will be actively cooled with the hydrogen that is used as a fuel for the engines and will see a hot oxidizing atmosphere. Because successful development of the necessary materials and efficient structural concepts is vital to allow NASP to achieve its goals, an augmented program for materials and structures development has been established. The paper describes this cooperative program and indicates the general activities underway, the materials studied, the approaches followed, and the general properties developed. The major materials classes include titanium-aluminides, titanium-aluminide metal matrix composites, carbon-carbon composites, ceramic-matrix composites, beryllium alloys, and copper-matrix composites.

Author

Aerospace Planes; Carbon-Carbon Composites; Ceramic Matrix Composites; Mechanical Properties; Metal Matrix Composites; National Aerospace Plane Program; Structural Design; Titanium Aluminides

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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*.

20080029302 Iowa State Univ. of Science and Technology, Ames, IA, USA

Center for Catalysis at Iowa State University. Final Report. Revised September 2006

Kraus, G. A.; Sep. 2006; 9 pp.; In English

Contract(s)/Grant(s): DE-FG36-04GO14238

Report No.(s): DE2007-893416; No Copyright; Avail.: Department of Energy Information Bridge

The overall objective of this proposal is to enable Iowa State University to establish a Center that enjoys world-class stature and eventually enhances the economy through the transfer of innovation from the laboratory to the marketplace. The funds have been used to support experimental proposals from interdisciplinary research teams in areas related to catalysis and green chemistry. Specific focus areas included: (1) Catalytic conversion of renewable natural resources to industrial materials; (2) Development of new catalysts for the oxidation or reduction of commodity chemicals; (3) Use of enzymes and microorganisms in biocatalysis; and (4) Development of new, environmentally friendly reactions of industrial importance. These focus areas intersect with barriers from the MYTP draft document. Specifically, section 2.4.3.1 Processing and Conversion has a list of bulleted items under Improved Chemical Conversions that includes new hydrogenation catalysts, milder oxidation catalysts, new catalysts for dehydration and selective bond cleavage catalysts. Specifically, the four sections are: (1) Catalyst development (7.4.12.A), (2) Conversion of glycerol (7.4.12.B), (3) Conversion of biodiesel (7.4.12.C), and (4) Glucose from starch (7.4.12.D). All funded projects are part of a soybean or corn biorefinery.

NTIS

Catalysis; Catalysts; Fuels; Bioconversion; Technology Transfer; Product Development

20080029321 BBWI, Idaho Falls, ID, USA

Mass Spectrometer and Methods of Increasing Dispersion Between Ion Beams

Appelhans, A. D., Inventor; Olson, J. E., Inventor; Delmore, J. E., Inventor; 16 Jun 04; 16 pp.; In English

Contract(s)/Grant(s): DE-AC07-991D13727

Patent Info.: Filed Filed 16 Jun 04; US-Patent-Appl-SN-10-870-856

Report No.(s): PB2007-110064; No Copyright; Avail.: CASI: A03, Hardcopy

A mass spectrometer includes a magnetic sector configured to separate a plurality of ion beams, and an electrostatic sector configured to receive the plurality of ion beams from the magnetic sector and increase separation between the ion beams, the

electrostatic sector being used as a dispersive element following magnetic separation of the plurality of ion beams. Other apparatus and methods are provided.
NTIS
Ion Beams; Mass Spectrometers; Patent Applications

20080029326 Colorado State Univ., Fort Collins, CO, USA
Interactions of Neutral Vanadium Oxide and Titanium Oxide Clusters with Sulfur Dioxide, Nitrogen Oxides and Water. Final Technical Report
Bernsteing, E.; Aug. 2006; 18 pp.; In English
Report No.(s): DE2007-890716; No Copyright; Avail.: Department of Energy Information Bridge

Our work over the past three years has focused on three phases of the proposed effort. The three phases are (1) establishment of the neutral metal oxide cluster distribution, (2) determination of the neutral cluster and product distribution following passage of the metal oxide clusters through the reaction cell with particular pressure of reactant gas molecules, and (3) DFT calculations of the active neutral cluster structures, isomers, electronic states, ions, complexes with relevant gas molecules (e.g., VzO3(SO2), ...), and relative energies for all relevant species. The next steps in this program will involve more extensive exploration of the metal oxide/molecule potential energy and reaction surfaces, exploration of the relation between cluster studies and condensed phase behavior, and experimental and theoretical consideration of the return or catalyst regeneration processes to complete the catalytic cycle.
NTIS
Nitrogen Oxides; Sulfur Dioxides; Titanium Oxides; Vanadium Oxides; Water

20080029343 Florida Univ., Gainesville, FL, USA
Permeability of Concrete - Comparison of Conductivity and Diffusion Methods
Vivas, E.; Jun. 2007; 238 pp.; In English
Contract(s)/Grant(s): 00026899
Report No.(s): PB2007-112669; No Copyright; Avail.: CASI: A11, Hardcopy

The report details research conducted on methods used to rapidly determine the resistance of concrete to the penetration of chloride ions. These methods, based on the electrical conductivity of concrete were Rapid Chloride Permeability (RCP) (AASHTO T277, ASTM C1202), Rapid Migration Test (RMT) (NordTest NTBuild 492), Surface Resistivity (SR) (FM 5-578), and Impressed Current (FM 5-522). The results of these conductivity tests were compared to the Bulk Diffusion (NordTest NTBuild 443) and AASHTO T259 test methods, which allow a more natural penetration of the concrete by the chlorides.
NTIS
Chlorides; Concretes; Ions; Electrical Resistivity

20080029382 NASA Johnson Space Center, Houston, TX, USA
Determination of Silicon in Hydrazine
McClure, Mark B.; Mast, Dion; Greene, Ben; Maes, Miguel J.; March 06, 2006; 9 pp.; In English; JANNAF 33rd PEDCS, 6-10 Mar. 2006, Sandestin, FL, USA; Copyright; Avail.: CASI: A02, Hardcopy

Inductively coupled plasma-mass spectrometry (ICP-MS) is a highly sensitive technique sometimes used for the trace determination of silicon at a mass-to-charge (m/z) ratio of 28, the most abundant natural isotope of silicon. Unfortunately, ICP-MS is unable to differentiate between other sources of m/z 28 and false positive results for silicon will result when other sources of m/z 28 are present. Nitrogen was a major source of m/z 28 and contributes to the m/z 28 signal when hydrazine sample or nitric acid preservative is introduced into the plasma. Accordingly, this work was performed to develop a sample preparation step coupled with an ICP-MS analysis that minimized non-silicon sources of m/z 28. In the preparatory step of this method, the hydrazine sample was first decomposed predominately to nitrogen gas and water with copper-catalyzed hydrogen peroxide. In the analysis step, ICP-MS was used without nitric acid preservative in samples or standards. Glass, a potential source of silicon contamination, was also avoided where possible. The method was sensitive, accurate, and reliable for the determination of silicon in monopropellant grade hydrazine (MPH) in AF-E-332 elastomer leaching tests. Results for silicon in MPH were comparable to those reported in the literature for other studies.
Author
Silicon; Hydrazines

20080030084 Morgan, Lewis, and Bockius, Washington, DC, USA; Affymetrix, Inc., DE, USA
Photocleavable Protecting Groups and Methods for Their Use
McGall, G. H., Inventor; Nam, N. Q., Inventor; Rava, R. P., Inventor; 14 Apr 05; 16 pp.; In English
Contract(s)/Grant(s): ATP-70NANB5H1031
Patent Info.: Filed Filed 14 Apr 05; US-Patent-Appl-SN-11-105-571
Report No.(s): PB2007-110644; No Copyright; Avail.: CASI: A03, Hardcopy

Novel compounds are provided which are useful as linking groups in chemical synthesis, preferably in the solid phase synthesis of oligonucleotides and polypeptides. These compounds are generally photolabile and comprise protecting groups which can be removed by photolysis to unmask a reactive group. The protecting group has the general formula Ar--C(R(sub 1))(R(sub 2))--O--C(O)-- wherein: Ar is an optionally substituted fused polycyclic aryl or heteroaromatic group or a vinylogous derivative thereof; R(sub 1) and R2 are independently H, optionally substituted alkyl, alkenyl or alkynyl, optionally substituted aryl or optionally substituted heteroaromatic, or a vinylogous derivative of the foregoing; and X is a leaving group, a chemical fragment linked to Ar--C(R(sub 1))(R(sub 2))--O--C(O)-- via a heteroatom, or a solid support; provided that when Ar is 1-pyrenyl and R(sub 1) and R(sub 2) are H, X is not linked to Ar--C(R(sub 1))(R(sub 2))--O--C(O)-- via a nitrogen atom. Preferred embodiments are those in which Ar is a fused polycyclic aromatic hydrocarbon and in which the substituents on Ar, R(sub 1) and R(sub 2) are electron donating groups. A particularly preferred protecting group is the 'PYMOC' protecting group, pyrenylmethyloxycarbonyl, where Ar is pyrenyl and R(sub 1) and R(sub 2) are H. Also provided is a method of forming, from component molecules, a plurality of compounds on a support, each compound occupying a separate predefined region of the support, using the protected compounds described above.
NTIS
Solid Phases; Synthesis (Chemistry); Chemical Compounds

20080030112 NASA Goddard Space Flight Center, Greenbelt, MD, USA
In-Field Diffuse Ultraviolet Spectroscopy and Imaging of the Stardust Sample Return Capsule
Pugel, D. Elizabeth; Stackpoole, Mairead; McNamara, Karen; Schwartz, C.; Warren, J.; Kontinos, Dean; [2008]; 1 pp.; In English; SPIE Optics and Photonics 2008, 10-14 Aug. 2008, San Diego, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

In-field diffuse Ultraviolet (UV) spectroscopy and imaging systems were developed for the purposes of evaluating the surface chemical composition of spacecraft thermal control coatings and materials. The investigation of these systems and the compilation of an associated UV reflectance and luminescence database were conducted using the Stardust Sample Return Capsule (SRC), located at the Johnson Space Center. Spectral responses of the surfaces of the Stardust forebody and aftbody in both reflectance and fluorescence modes were examined post-flight. In this paper, we report on two primary findings of in-field diffuse UV spectroscopy and imaging: (1) deduction of the thermal history of thermal control coatings of the forebody and (2) bond line variations in the aftbody. In the forebody, the thermal history of thermal control coatings may be deduced from the presence of particular semiconducting defect states associated with ZnO, a common emissivity constituent in thermal control coatings. A spatial dependence of this history was mapped for these regions. In the aftbody, luminescing defect states, associated with Si and SiO2 color centers were found along regions of bond variability.
Author
Ultraviolet Spectroscopy; Stardust Mission; Thermal Control Coatings; Chemical Composition; Satellite Surfaces; Space Capsules

20080030204 Foley and Lardner, LLP, Washington, DC, USA
On-Chip Temperature Controlled Liquid Chromatography Methods and Devices
Tai, Y. C., Inventor; Shih, C. Y., Inventor; He, Q., Inventor; Xie, J., Inventor; 17 Feb 05; 24 pp.; In English
Contract(s)/Grant(s): NSF-EEC-9402726
Patent Info.: Filed Filed 17 Feb 05; US-Patent-Appl-SN-11-059-625
Report No.(s): PB2007-110673; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for liquid chromatography comprises a liquid chromatography separation column on a substrate, wherein the separation column is coupled to a heater on the substrate. A chip-based temperature controlled liquid chromatography device comprises a substrate, a thermal isolation zone, and a separation column thermally isolated from the substrate by the thermal isolation zone. An apparatus for chip-based liquid chromatography comprising a cooling device is provided. A temperature gradient liquid chromatography system comprises a chip-based temperature controlled liquid chromatography

device, a fluidic coupling, and an electrical interface. Methods of making and methods of using of chip-based temperature gradient liquid chromatography devices are also provided.
NTIS
Chips (Electronics); Controllers; Liquid Chromatography; Patent Applications

20080030405 California Univ., Berkeley, CA USA
Modified Activated Carbon Perchlorate Sorbents
Lukens, Jr, Wayne W; Jan 25, 2007; 42 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DE-AC02-05CH11231; Proj-ER-1428
Report No.(s): AD-A479717; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479717

A new method for improving the selectivity of activated carbons for adsorbing perchlorate has been developed. The technique involves alkylation of functional groups present on the activated carbon surface. The modified activated carbon typically have adsorption capacities 5-10 times that of the parent activated carbon. The technique is believed to mainly alkylate the oxygen surface groups rather than the nitrogen surface groups.
DTIC
Activated Carbon; Perchlorates; Sorbents

20080030857 Universal Energy Systems, Inc., Dayton, OH USA
Two Phase Monazite/Xenotime 30LaPO4-70YPO4 Coating of Ceramic Fiber Tows (Postprint)
Boakye, E E; Hay, R S; Mogilevsky, P; Cinibulk, M K; Apr 2008; 11 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5233; Proj-4347
Report No.(s): AD-A480127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Equiaxed yttrium-lanthanum phosphate nanoparticles (Y(0.7),La(0.3))PO4(dot)0.7H2O were made and used to continuously coat Nextel(Trademark) 720 fiber tows. The particles were precipitated from a mixture of yttrium and lanthanum citrate chelate and phosphoric acid (H3PO4), and characterized with differential thermal analysis and thermogravimetric analysis, X-ray diffraction, transmission electron microscopy, and scanning electron microscopy. The coated fibers were heat treated at 1000-1300 deg C for 1, 10, and 100 h. Coating grain growth kinetics and coated fiber strengths were determined and compared with equiaxed La-monazite coatings. The relationships between coating porosity, coating hermeticity, and coated fiber strength are discussed.
DTIC
Ceramic Fibers; Coating; Coatings; Composite Materials; Thermal Analysis; Thermogravimetry; X Ray Diffraction; Yttrium

20080030858 Army Missile Research, Development and Engineering Lab., Redstone Arsenal, AL USA
Low Cost Zinc Sulfide Missile Dome Manufacturing
Haynes, Anthony; Apr 21, 2008; 6 pp.; In English
Report No.(s): AD-A480072; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In conclusion, the new Army ManTech Program 'Low Cost Zinc Sulfide Missile Dome Manufacturing' is currently addressing advanced manufacturing methods for lower unit production cost of multispectral zinc sulfide domes. While Dome Program personnel are still working out some of the details of the program, the objectives and planned improvements have been provided along with a program schedule and potential transitions to current DoD programs. The recent emphasis on development of affordable tri-mode seeker technologies has also been discussed. The AMRDEC Affordability and Manufacturing Engineering Team anticipates great successes on this program, and plans to take every opportunity to present these successes to achieve the widest possible dissemination to the DoD community.
DTIC
Low Cost; Manufacturing; Missiles; Zinc Sulfides

20080030927 White Sands Test Facility, Las Cruces, NM, USA
Manufacturing of Igniters for NHB 8060.1 Testing
Williams, James; March 1996; 11 pp.; In English; Igniter Preparation Training for JAXA Employees, 26 May 2006, Las Cruces,NM, USA; Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this WJI is to incorporate a standard procedure to prepare, certify, and ship standard NHB 8060.1B and NHB 8060.1C igniters for flammability testing and to update LJI-320-35-18. The operations are divided into five parts as

follows: A. Preparing the igniter mix; B. Extruding the igniters; C. Curing, cutting, and weighing the igniters; D. Certifying the igniters and E. Packaging, storing, and shipping the igniters
Derived from text
Flammability; Igniters; Ignition; Ignition Systems; Incendiary Ammunition

26
METALS AND METALLIC MATERIALS

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

20080026315 Selee Corp., Hendersonville, NC, USA
Selective Adsorption of Sodium Alumminum Fluoride Salts from Molten Aluminum. Report for the Period of June 1, 2006 to December 31, 2004
Aubery, L. S.; January 2004; 33 pp.; In English
Contract(s)/Grant(s): DE-FC36-00ID13899
Report No.(s): DE2007-912665; No Copyright; Avail.: Department of Energy Information Bridge

Aluminum is produced in electrolytic reduction cells where alumina feedstock is dissolved in molten cryolite (sodium aluminum fluoride) along with aluminum and calcium fluorides. The dissolved alumina is then reduced by electrolysis and the molten aluminum separates to the bottom of the cell. The reduction cell is periodically tapped to remove the molten aluminum. During the tapping process, some of the molten electrolyte (commonly referred as bath in the aluminum industry) is carried over with the molten aluminum and into the transfer crucible. The carryover of molten bath into the holding furnace can create significant operational problems in aluminum cast houses. Bath carryover can result in several problems. The most troublesome problem is sodium and calcium pickup in magnesium-bearing alloys. Magnesium alloying additions can result in Mg-Na and Mg-Ca exchange reactions with the molten bath, which results in the undesirable pickup of elemental sodium and calcium. This final report presents the findings of a project to evaluate removal of molten bath using a new and novel micro-porous filter media. The theory of selective adsorption or removal is based on interfacial surface energy differences of molten aluminum and bath on the micro-porous filter structure. This report describes the theory of the selective adsorption-filtration process, the development of suitable micro-porous filter media, and the operational results obtained with a micro-porous bed filtration system.
NTIS
Adsorption; Electrolytic Cells; Sodium Fluorides; Aluminum Fluorides; Salts

20080026322 Timmer (Edward J.), Richland, MI, USA
Permanent Magnet Alloy with Improved High Temperature Performance
McCallum, R. W., Inventor; Xu, Y., Inventor; Kramer, M. J., Inventor; Anderson, I. E., Inventor; Dennis, K. W., Inventor; 11 May 05; 27 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-82
Patent Info.: Filed Filed 11 May 05; US-Patent-Appl-SN-11-126-484
Report No.(s): PB2007-110523; No Copyright; Avail.: CASI: A03, Hardcopy

A permanent magnet material is provided and includes a major phase represented by MRE(sub 2)Tr(sub 14)X wherein MRE comprises Y and at least one other rare earth element with Y being present as 15% or more of the MRE on an atomic basis, Tr is a transition element, and X is an element selected from the group consisting of B and C.
NTIS
High Temperature; Patent Applications; Permanent Magnets

20080026324 Bachman and Lapointe, P.C., New Haven, CT, USA
Carbo-Nitrided Case Hardened Martensitic Stainless Steels
Chin, H. A., Inventor; Ogden, W. P., Inventor; Haluck, D. A., Inventor; 2 Jun 04; 6 pp.; In English
Contract(s)/Grant(s): AF-F33615-01-C-2176
Patent Info.: Filed Filed 2 Jun 04; US-Patent-Appl-SN-10-859-371
Report No.(s): PB2007-110521; No Copyright; Avail.: CASI: A02, Hardcopy

A carbo-nitriding process for forming a martensitic stainless steel, which is case hardened and superior corrosion resistance over carburized process, is provided. A process for forming a martensitic stainless steel which is case hardened is provided. The process comprises the steps of providing a material consisting essentially of from 8.0 to 18 wt % chromium,

cobalt up to 16 wt %, vanadium up to 5.0 wt %, molybdenum up to 8.0 wt %, nickel up to 8.0 wt %, manganese up to 4.0 wt %, silicon up to 2.0 wt %, tungsten up to 6.0 wt %, titanium up to 2.0 wt %, niobium up to 4.0 wt % and the balance iron, and carbo-nitriding to prescribed levels of C+N, to form a hard, corrosion resistance case in a fracture tough stainless steel.
NTIS
Corrosion Resistance; Martensitic Stainless Steels; Nitriding; Patent Applications

20080029301 Michigan Technological Univ., Houghton, MI, USA
Verification of Steelmaking Slag Iron Content. Final Technical Progress Report May 1, 2001 through April 30, 2006
Sep. 2006; 78 pp.; In English
Contract(s)/Grant(s): DE-FC36-01ID14046
Report No.(s): DE2007-892748; No Copyright; Avail.: National Technical Information Service (NTIS)

The steel industry in the USA generates about 30 million tons of by-products each year, including 6 million tons of desulfurization and BOF/BOP slag. The recycling of BF (blast furnace) slag has made significant progress in past years with much of the material being utilized as construction aggregate and in cementitious applications. However, the recycling of desulfurization and BOF/BOP slags still faces many technical, economic, and environmental challenges. Previous efforts have focused on in-plant recycling of the by-products, achieving only limited success. As a result, large amounts of by-products of various qualities have been stockpiled at steel mills or disposed into landfills. After more than 50 years of stockpiling and landfilling, available mill site space has diminished and environmental constraints have increased. The prospect of conventionally landfilling of the material is a high cost option, a waste of true national resources, and an eternal material liability issue. The research effort has demonstrated that major inroads have been made in establishing the viability of recycling and reuse of the steelmaking slags. The research identified key components in the slags, developed technologies to separate the iron units and produce marketable products from the separation processes. Three products are generated from the technology developed in this research, including a high grade iron product containing about 90%Fe, a medium grade iron product containing about 60% Fe, and a low grade iron product containing less than 10% Fe. The high grade iron product contains primarily metallic iron and can be marketed as a replacement of pig iron or DRI (Direct Reduced Iron) for steel mills. The medium grade iron product contains both iron oxide and metallic iron and can be utilized as a substitute for the iron ore in the blast furnace. The low grade iron product is rich in calcium, magnesium and iron oxides and silicates. It has a sufficient lime value and can be utilized for acid mine drainage treatment.
NTIS
Industries; Iron; Slags; Steels; Waste Utilization

20080029307 Timmer (Edward J.), Richland, MI, USA; Iowa State Univ. Research Foundation, Inc., Ames, IA, USA
Intermetallic Articles of Manufacture Having High Room Temperature Ductility
Gschneidner, K. A., Inventor; Russell, A. M., Inventor; Pecharsky, V. K., Inventor; Tsokol, A. O., Inventor; 3 May 05; 32 pp.; In English
Contract(s)/Grant(s): DOE-W-7405-ENG-82
Patent Info.: Filed Filed 3 May 05; US-Patent-Appl-SN-11-120-547
Report No.(s): PB2007-110682; No Copyright; Avail.: CASI: A03, Hardcopy

Article of manufacture fabricated by plastic deformation of an intermetallic compound comprising R and M, such as an RM intermetallic compound and a higher order compound thereof, having a CsCl-type ordered crystal structure wherein R is one or more rare earth elements and M is one or more non-rare earth metals. The article of manufacture has a tensile elongation of at least about 5% prior to fracture when tensile tested at room temperature in ambient air. The article of manufacture also can be fabricated by plastic deformation of an intermetallic compound comprising a M and M compound and a higher order compound thereof having a CsCl-type ordered crystal structure wherein M and M are one or more different non-rare earth metals.
NTIS
Ductility; High Temperature; Intermetallics; Room Temperature

20080029353 International Trade Commission, Washington, DC USA
Steel Concrete Reinforcing Bar from Belarus, China, Indonesia, Korea, Latvia, Moldova, Poland, and Ukraine. Investigation Nos. 731-TA-873-875, 877-880, and 882 (Review)
Jul. 2007; 330 pp.; In English
Report No.(s): PB2007-113255; USITC/PUB-3933; No Copyright; Avail.: CASI: A15, Hardcopy

In 2001, in a series of staggered investigations, the Commission determined that an industry in the USA was materially

injured by reason of imports of rebar from Belarus, Indonesia, Korea, Latvia, Moldova, Poland, and Ukraine and that an industry in the USA was threatened with material injury by reason of imports of rebar from China.
NTIS
Belarus; China; Concretes; Indonesia; International Trade; Korea; Latvia; Moldova; Poland; Steels; Ukraine

20080029354 International Trade Commission, Washington, DC USA
Circular Welded Carbon-Quality Steel Pipe from China. Investigation Nos. 701-TA-447 and 731-TA-1116 (Preliminary)
Jul. 2007; 192 pp.; In English
Report No.(s): PB2007-113256; USITC/PUB-3938; No Copyright; Avail.: CASI: A09, Hardcopy

On June 7, 2007, a petition was filed with the Commission and Commerce by Allied Tube & Conduit, Harvey, IL; IPSCO Tubulars, Inc., Camanche, IA; Northwest Pipe Co., Portland, OR; Sharon Tube Co., Sharon, PA; Western Tube & Conduit Corp., Long Beach, CA; Wheatland Tube Co., Collingswood, NJ; and the United Steelworkers, Pittsburgh, PA, alleging that an industry in the USA is materially injured and threatened with material injury by reason of subsidized and LTFV imports of circular welded carbon-quality steel pipe from China. Accordingly, effective June 7, 2007, the Commission instituted countervailing duty investigation No. 701-TA-447 (Preliminary) and antidumping duty investigation No. 731-TA-1116 (Preliminary). Notice of the institution of the Commission's investigations and of a public conference to be held in connection therewith was given by posting copies of the notice in the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and by publishing the notice in the Federal Register of June 14, 2007 (72 FR 32862). The conference was held in Washington, DC, on June 28, 2007, and all persons who requested the opportunity were permitted to appear in person or by counsel.
NTIS
Carbon Steels; China; International Trade; Pipes (Tubes)

20080029367 NASA Johnson Space Center, Houston, TX, USA
Oxygen Fugacity at High Pressure: Equations of State of Metal-Oxide Pairs
Campbell A. J.; Danielson, L.; Righter, K.; Wang, Y.; Davidson, G.; Wang, Y.; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, Houston, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

Oxygen fugacity (fO2) varies by orders of magnitude in nature, and can induce profound changes in the chemical state of a substance, and also in the chemical equilibrium of multicomponent systems. One prominent area in high pressure geochemistry, in which fO2 is widely recognized as a principal controlling factor, is that of metal-silicate partitioning of siderophile trace elements (e.g., [1]). Numerous experiments have shown that high pressures and temperatures can significantly affect metal/silicate partitioning of siderophile and moderately siderophile elements. Parameterization of these experimental results over P, T, X, and fO2 can allow the observed siderophile element composition of the mantle to be associated with particular thermodynamic conditions [2]. However, this is best done only if quantitative control exists over each thermodynamic variable relevant to the experiments. The fO2 values for many of these partitioning experiments were determined relative to a particular metal-oxide buffer (e.g., Fe-FeO (IW), Ni-NiO (NNO), Co-CoO, Re-ReO2 (RRO)), but the parameterization of all experimental results is weakened by the fact that the pressure-induced relative changes between these buffer systems are imprecisely known.
Author
Oxygen; Thermodynamics; Geochemistry; Chemical Equilibrium; High Pressure; Iron Oxides; Metal Oxides; Equations of State

20080030355 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Metal Whiskers: Failure Modes and Mitigation Strategies
Brusse, Jay A.; Leidecker, Henning; December 04, 2007; 1 pp.; In English; Microelectronics Reliability and Qualification Workshop, 4-5 Dec. 2007, Manhattan Beach, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Metal coatings especially tin, zinc and cadmium are unpredictably susceptible to the formation of electrically conductive, crystalline filaments referred to as metal whiskers. The use of such coatings in and around electrical systems presents a risk of electrical shorting. Examples of metal whisker formation are shown with emphasis on optical inspection techniques to improve probability of detection. The failure modes (i.e., electrical shorting behavior) associated with metal whiskers are

described. Based on an almost 9- year long study, the benefits of polyurethane conformal coat (namely, Arathane 5750) to protect electrical conductors from whisker-induced short circuit anomalies is discussed.
Author
Metal Coatings; Whisker Composites; Cadmium; Zinc; Tin; Probability Theory; Polyurethane Resins; Detection

20080030459 Fraunhofer Inst. fuer Kurzzeidynamik, Breisgau, Germany
Characterization of the Material Microstructure for Reactive Material Design
Klomfass, Arno; Knell, Sascha; Sauer, Martin; Bagusat, Frank; Apr 2008; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-07-1-1053; Proj-006-276-480
Report No.(s): AD-A479850; I-13/08; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479850

The aim envisaged in this project is the development and validation of numerical methods for the mechanical simulation of materials at grain scale. These methods shall enable predictive analysis of the dependencies of the mechanical properties -- especially the fragmentation behavior -- on the morphological and constitutive nature of a material at grain scale. Simulation capability of this kind can be effectively applied to design new materials with specially tailored mechanical properties. Specifically, this project is motivated by the aim to design (metallic) materials, which fragment under certain dynamic loading conditions into small particles, which can chemically react with a suitable ambient medium, such as shock heated ambient air or hot detonation products. Such materials could be effectively used to devise new or improved weapons with enhanced mechanical and/or thermal effects.
DTIC
Fragmentation; Mathematical Models; Microstructure; Reactivity

20080030647 General Accounting Office, Washington, DC USA
Defense Management: Observations of DOD's FY 2009 Budget Request for Corrosion Prevention and Control
Apr 15, 2008; 17 pp.; In English
Report No.(s): AD-A480195; GAO-08-663R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This letter formally transmits the attached briefing in response to section 371 of the National Defense Authorization Act for Fiscal Year 2008. The act requires GAO to provide an analysis of DOD's budget submission for corrosion control and prevention and a DOD report that was to be submitted with defense budget materials to the congressional defense committees within 60 days after submission of the budget for a fiscal year. On April 3, 2008, we provided the briefing to staff of your committees to satisfy the mandate and 60-day reporting requirement.
DTIC
Corrosion Prevention; Federal Budgets

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*.

20080029309 Myers (Peacock), P.C., Albuquerque, NM, USA; Optomec Design Co., Albuquerque, NM, USA
Annular Aerosol Jet Deposition Using an Extended Nozzle
King, B. H., Inventor; Renn, M. J., Inventor; Essien, M., Inventor; Marquez, G. J., Inventor; 13 Dec 04; 13 pp.; In English
Contract(s)/Grant(s): DOD-N00014-99-C-0243
Patent Info.: Filed Filed 13 Dec 04; US-Patent-Appl-SN-11-011-366
Report No.(s): PB2007-113690; No Copyright; Avail.: CASI: A03, Hardcopy

Method and apparatus for improved maskless deposition of electronic and biological materials using an extended nozzle. The process is capable of direct deposition of features with linewidths varying from a few microns to a fraction of a millimeter, and can be used to deposit features on targets with damage thresholds near 100 degrees C. or less. Deposition and subsequent processing may be performed under ambient conditions and produce linewidths as low as 1 micron, with sub-micron edge definition. The extended nozzle reduces particle overspray and has a large working distance; that is, the orifice to target

distance may be several millimeters or more, enabling direct write onto non-planar surfaces. The nozzle allows for deposition of features with linewidths that are approximately as small as one-twentieth the size of the nozzle orifice diameter, and is preferably interchangeable, enabling rapid variance of deposited linewidth.
NTIS
Aerosols; Annular Flow; Deposition; Gas Flow; Patent Applications

20080029318 Chicago Univ., Chicago, IL USA
Construction Material (PAT-APPL-11-204-331)
Wagh, A. S., Inventor; Antink, A. L., Inventor; 15 Aug 05; 8 pp.; In English
Contract(s)/Grant(s): DE-W-31-109-ENG-38
Patent Info.: Filed Filed 15 Aug 05; US-Patent-Appl-SN-11-204-331
Report No.(s): PB2007-110076; No Copyright; Avail.: CASI: A02, Hardcopy

A structural material of a polystyrene base and the reaction product of the polystyrene base and a solid phosphate ceramic is applied as a slurry which includes one or more of a metal oxide or a metal hydroxide with a source of phosphate to produce a phosphate ceramic and a poly (acrylic acid or acrylate) or combinations or salts thereof and polystyrene or MgO applied to the polystyrene base and allowed to cure so that the dried aqueous slurry chemically bonds to the polystyrene base. A method is also disclosed of applying the slurry to the polystyrene base.
NTIS
Ceramics; Patent Applications; Phosphates; Polystyrene

20080029319 Chicago Univ., Chicago, IL USA
Method of Binding Structural Material
Wagh, A. S., Inventor; Antink, A. L., Inventor; 15 Aug 05; 8 pp.; In English
Contract(s)/Grant(s): DE-W-31-109-ENG-38
Patent Info.: Filed Filed 15 Aug 05; US-Patent-Appl-SN-11-204-332
Report No.(s): PB2007-110075; No Copyright; Avail.: CASI: A02, Hardcopy

A structural material of a polystyrene base and the reaction product of the polystyrene base and a solid phosphate ceramic. The ceramic is applied as a slurry which includes one or more of a metal oxide or a metal hydroxide with a source of phosphate to produce a phosphate ceramic and a poly (acrylic acid or acrylate) or combinations or salts thereof and polystyrene or MgO applied to the polystyrene base and allowed to cure so that the dried aqueous slurry chemically bonds to the polystyrene base. A method is also disclosed of applying the slurry to the polystyrene base.
NTIS
Ceramics; Patent Applications; Phosphates; Polystyrene

20080029341 Dierker and Assoc., P.C., Troy, MI, USA
Use of Additive Sites to Control Nitric Oxide Release from NITRIC Oxide Donors Contained within Polymers
Meyerhoff, M. E., Inventor; Reynolds, M. M., Inventor; Zhou, Z., Inventor; 12 Jul 04; 24 pp.; In English
Contract(s)/Grant(s): SBIR-1R43-HL072624-01
Patent Info.: Filed Filed 12 Jul 04; US-Patent-Appl-SN-10-889-646
Report No.(s): PB2007-113692; No Copyright; Avail.: CASI: A03, Hardcopy

A method for increasing, prolonging, and/or controlling the release rates of nitric oxide (NO) from polymeric materials containing NO adducts. Such NO-containing polymeric materials may find use in devices such as blood contacting devices, and biocompatible devices utilizing the same. The method and device utilizes anionic site additives, acidic site additives and/or acidic producing site additives in a polymer that contains NO-adducts to generate higher fluxes of NO to exceed NO threshold levels desirable to substantially prevent and/or minimize reactions such as platelet activation or adhesion.
NTIS
Additives; Nitric Oxide; Patent Applications

20080030124 Pennington (Joan), Chicago, IL, USA; Chicago Univ., Chicago, IL USA
Method and Apparatus for Separating Mixed Plastics using Flotation Techniques
Daniels, E. J., Inventor; Jody, B. J., Inventor; Pomykala, J. A., Inventor; 14 Jun 04; 14 pp.; In English
Contract(s)/Grant(s): ANL-W-31-109-ENG-38

Patent Info.: Filed Filed 14 Jun 04; US-Patent-Appl-SN-10-866-963
Report No.(s): PB2007-110681; No Copyright; Avail.: CASI: A03, Hardcopy

A method and apparatus are provided for separating mixed plastics using flotation techniques including a first stage initial washing tank for washing of incoming plastics and providing a first separation process and at least one separation module. The first stage initial washing tank includes a perforated basket to hold heavy materials, such as metals, glass, and the like. Each separation module includes a separation tank, a feeding section for feeding of mixed stream into the separation tank; and a collecting section for collecting of the separated mixed plastics including floaters and sinkers from the separation tank. The separation tank has no moving parts. Each separation tank and the first stage initial washing tank is a standard off-the-shelf circular tank with a flat bottom. Washing and drying steps are eliminated between separation stages. Batch processing is replaced with generally continuous operation. An integrated vibrating screen and air classification system is provided.
NTIS
Flotation; Patent Applications; Plastics

20080030135 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA
Composition and Application of Novel Sprayable Phosphate Cement (Grancrete) That Bonds to Styrofoam
Wagh, A. S., Inventor; Paul, J. W., Inventor; 15 Jun 04; 5 pp.; In English
Contract(s)/Grant(s): DOE-W-31-109-ENG-38
Patent Info.: Filed Filed 15 Jun 04; US-Patent-Appl-SN-10-868-062
Report No.(s): PB2007-110675; No Copyright; Avail.: CASI: A01, Hardcopy

A dry mix particulate composition of a calcined oxide of Mg and/or Ca, an acid phosphate, and fly ash or equivalent, wherein the calcined oxide is present in the range of from about 17% to about 40% by weight and the acid phosphate is present in the range of from about 29% to about 52% by weight and the fly ash or equivalent is present in the range of from about 24% to about 39% by weight when sand is added to the dry mix, it is present in the range of from about 39% to about 61% by weight of the combined dry mix and sand. A method of forming a structural member is also disclosed wherein an aqueous slurry of about 8-12 pounds of water is added to dry mix and sand.
NTIS
Bonding; Cements; Ceramics; Patent Applications; Phosphates; Styrofoam (Trademark)

20080030445 Army Tank-Automotive Research and Development Command, Warren, MI USA
Now Is the Time for an Axle Lubricant Efficiency Standard
Comfort, Allen S; Apr 15, 2008; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479829; TARDEC-18830; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479829

The Army is interested in working with SAE TC-3 membership to develop an axle lubricant efficiency test for light-duty and heavy-duty applications which can be implemented as part of SAE J2360.
DTIC
Lubricants; Shafts (Machine Elements)

20080030457 Army Tank-Automotive Research and Development Command, Warren, MI USA
Bio-based Hydraulic Fluids
Rhee, In-Sik; Apr 17, 2008; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479846; TARDEC-18809; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479846

Bio-based Hydraulic Fluids (BHFs) are currently formulated with vegetable oils (i.e. rapeseed, sun flower, corn, soybean, canola, coconut, etc.) and synthetic ester, such as polyol ester, and additive packages. Their lubrication properties are very similar to mineral oils and readily biodegradable and low toxic fluids. Some of the fluids have a limited operational capability such as a poor low temperature characteristics and oxidation stability. Many oil companies have developed bio-based fluids to eliminate the hazardous pollution caused by accidental oil spillage, which is especially important in environmentally sensitive applications such as construction. Another good reason to use bio-based hydraulic fluids is to develop a market for US grown agricultural feedstock and to reduce reliance on overseas petroleum crude oil.
DTIC
Hydraulic Fluids; Oils; Vegetables

20080030566 Naval Postgraduate School, Monterey, CA USA

Real-Time Dispatching of Rubber Tired Gantry Cranes in Container Terminals

McNary, Bradley S; Mar 2008; 57 pp.; In English

Report No.(s): AD-A479957; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Within the past 50 years containerization and globalization have driven a change from small container terminals to large container terminals that need efficient logistic models to keep up with the significant growth in container traffic. Efficiently managing of rubber tired gantry cranes and planning container placement within the terminal are two ways to increase the overall efficiency of a terminal. In this thesis, we combine these strategies in a real-time dispatching tool using an approximate dynamic programming heuristic. The heuristic re-optimizes at the rate the quay crane handles containers, incorporating endogenous and exogenous information in each solution. We formulated and solved an Integer Linear Program (ILP) to estimate the heuristic's solution quality. The heuristic finds solutions within seconds and the absolute gap between the heuristic solution and the ILP solutions remained essentially constant as the size of the problem increased.

DTIC

Cranes; Distributing; Gantry Cranes; Materials Handling; Real Time Operation; Rubber

20080030638 Advantech, Inc., Annapolis, MD USA

ARN VIM IRM Implementation at Kentucky Logistics Operations Center (KYLOC) Central Clothing Distribution Facility (CCDF)

Perrin, Richard A; Bona, Robert E; Brekhus, Dennis A; DeLoach, Douglas D; Apr 2008; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): SPO103-02-D-0018

Report No.(s): AD-A480161; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Final Technical Report (FTR) covers project work accomplished for the Apparel Research Network (ARN)/Customer Driven Uniform Manufacture (CDUM) project of the Defense Logistics Agency (DLA). The overall project activities for this short term project specifically covered implementing Virtual Item Manager Integrated Retail Module Radio Frequency network in order to provide the Defense Supply Center Philadelphia (DSCP) retail visibility of the DLA owned inventory located at Kentucky Logistics Operation Center (KYLOC). Kentucky Logistics Operations Center (KYLOC) is a virtual prime vendor of Defense Supply Center Philadelphia (DSCP). This STP incorporated: (1) installation of a local area network; (2) data conversion from the central clothing distribution center (CCDF) legacy databases; (3) installation of a wireless network; (4) implementation of the Integrated Retail Module to capture the issue data; (5) implementation of Virtual Item Manager (VIM) as the inventory management system; and, (6) implementation of CabinetNG as the electronic filing cabinet for all issue forms.

DTIC

Clothing; Communication Networks; Inventory Controls; Logistics

20080030852 Applied Research Associates, Inc., Tyndall AFB, FL USA

Prefabricated Tilt-up Concrete Panels for Blast Resistant Design

Bewick, Bryan T; Salim, Hani A; Hoemann, John; Dinan, Robert J; Mar 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915

Report No.(s): AD-A479750; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479750

Engineering research efforts in the area of blast-resistant design is a priority of many government, military, and civilian organizations. Prefabricated tilt-up panels have become a very common method for conventional construction. This effort will present the development of an analytical model for creating static resistance functions which can be used in a single degree of freedom (SDOF) dynamic model. The results of the SDOF model can be used to predict and design the response of prefabricated tilt-up panels as blast walls. The paper will describe the performance of tilt-up panels for blast resistance using analytical models and full-scale field tests using live explosives. The results of the analytical dynamic model are verified using the field experiments, and the procedure is implemented into a user-friendly engineering design and analysis code, Air Force Wall Analysis Code (AFWAC).

DTIC

Attitude (Inclination); Concretes; Panels; Shelters

20080030923 Honeywell Technology Solutions Lab., Houston, TX, USA

Flammability Limits of Selected Polymers Commonly used in American Spacecraft

Hirsch, David; Beeson, Harold; April 06, 2006; 10 pp.; In English; Aerospace Testing Expo 2006 Europe, 4-6 Apr. 2006, Hamburg, Germany; Copyright; Avail.: CASI: A02, Hardcopy

This viewgraph presentation reviews the curent evaluation methods of aerospace materials flammability, and the flammability limits of commonly used spacecraft materials.

CASI

Flammability; Spacecraft Construction Materials; Materials Selection; Polymers

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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*.

20080030570 Naval Postgraduate School, Monterey, CA USA

Should the Department of Defense Hedge Oil Prices in Order to Save Money

Knapp, James W; Mar 2008; 59 pp.; In English

Report No.(s): AD-A479964; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper explores one possible solution to the DoD problem of increased expenditures due to rises in the costs of jet fuel. This paper provides a brief overview of the futures market and of commercially accepted practices utilized by the airlines within the futures market. The goal of this paper is to explore the feasibility of the government entering the futures market in order to reduce the current DoD jet fuel cost and whether the potential savings would outweigh the associated risks and costs. This paper briefly discusses the current method of procurement and examines the commercial practices of futures trading, focusing on the airline industry which offers the greatest affinity to the DoD.

DTIC

Airline Operations; Commercial Aircraft; Defense Program; Jet Engine Fuels; Oils

20080030580 Library of Congress, Washington, DC USA

Russian Energy Policy Toward Neighboring Countries

Woehrel, Steven; Nov 27, 2007; 24 pp.; In English

Report No.(s): AD-A479997; CRS-RL34261; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Russian oil and natural gas industries are increasingly important players in the global energy market, particularly in Europe and Eurasia. Another trend has been the increasing concentration of these industries in the hands of the Russian government. This latter phenomenon has been accompanied by an increasingly authoritarian political system under the control of President Vladimir Putin, in which former intelligence officers play key roles. Russian firms have tried to purchase a controlling stake in pipelines, ports, storage facilities, and other key energy assets of the countries of central and eastern Europe. They need these assets to transport energy supplies to lucrative western European markets, as well as to secure greater control over the domestic markets of the countries of the region. In several cases where assets were sold to non-Russian firms, Russian firms cut off energy supplies to the facilities. Russia has also tried to build new pipelines to circumvent infrastructure that it does not control. Another objective Russia has pursued has been to eliminate the energy subsidies former Soviet republics have received since the fall of the Soviet Union, including by raising the price these countries pay for natural gas to world market prices. It is not completely clear whether the pursuit of Russian foreign policy objectives is the primary explanation for the actions of its energy firms. Few would disagree in principle that the elimination of subsidies to post-Soviet countries is a sound business decision, even if questions have been raised about the timing of such moves. Even the pursuit of multiple pipelines can be portrayed as a business decision. On the other hand, many countries of the region are concerned that Russia may use their energy dependency to interfere in their domestic affairs or to force them to make foreign policy concessions.

DTIC

Asia; Crude Oil; Energy Policy; Europe; Foreign Policy; Natural Gas; Oils; U.S.S.R.

20080030583 Automotive Research Center, Ann Arbor, MI USA

Impact of High Sulfur Military JP-8 Fuel on Heavy Duty Diesel Engine EGR Cooler Condensate

Mosburger, Michael; Fuschetto, Jerry; Assanis, Dennis; Filipi, Zoran; McKee, Heather; Apr 14, 2008; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480006; 2008-01-1081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Low-sulfur 'clean' diesel fuel has been mandated in the US and Europe. However, quality of diesel fuel, particularly the sulfur content, varies significantly in other parts of the world. Due to logistical issues in various theaters of operation, the Army is often forced to rely on local fuel supplies, which exposes vehicles to diesel fuel or jet fuel (JP-8) with elevated levels of sulfur. Modern engines typically use cooled Exhaust Gas Recirculation (EGR) to meet emissions regulations. Using high-sulfur fuels and cooled EGR elevates problems associated with cooler fouling and corrosion of engine components. Hence, an experimental study has been carried out in a heavy-duty diesel engine running on standard JP-8 fuel and fuel doped with 2870 ppm of sulfur. Gas was sampled from the EGR cooler and analyzed using a condensate collection device developed according to a modified ASTM 3226-73T standard. Engine-out emissions were analyzed in parallel. Analysis of results indicates significantly increased levels of sulfur-dioxide and particulate mass with high-sulfur fuel, but negligible amounts of condensed sulfuric acid under normal operating temperatures.

DTIC

Condensates; Coolers; Diesel Engines; Exhaust Gases; Jet Engine Fuels; JP-8 Jet Fuel; Sulfur

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*.

20080030462 Army Tank-Automotive Research and Development Command, Warren, MI USA

Virtual Combat Vehicle Experimentation for Duty Cycle Measurement

Brudnak, Mark; Pozolo, Mike; Meldrum, AnnMarie; Mortsfield, Todd; Shvartsman, Andrey; Smith, Wilford; Goodell, Jarrett; Holtz, Dale; Apr 2008; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479855; TARDEC-18609RC; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479855

This paper describes a human-in-the-loop motion-based simulator which was designed, built and used to measure the duty cycle of a combat vehicle in a virtual simulation environment. The simulation environment integrates two advanced crew stations which implement both a driver's station and a gunner's station of a simulated future tank. The simulated systems of the tank include a series hybrid-electric propulsion system and its main weapon systems. The simulated vehicle was placed in a virtual combat scenario which was then executed by the participating Soldiers. The duty cycle as measured includes the commands of the driver and gunner as well as external factors such as terrain and enemy contact. After introducing the project, the paper describes the simulation environment which was assembled to run the experiment. It emphasizes the design of the experiment as well as the approach, challenges and issues involved. It presents the experiment results and briefly discusses on-going and future work.

DTIC

Combat; Crews; Motion; Simulation; Tanks (Combat Vehicles)

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*.

20080026269 NASA Langley Research Center, Hampton, VA, USA

Role of Lidar Technology in Future NASA Space Missions

Amzajerdian, Farzin; March 24, 2008; 7 pp.; In English; Material Research Society (MRS) 2008 Spring Meet, 24-28 Mar. 2008, San Francisco, CA, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 079749.04.04.04

Report No.(s): Paper-1076-K04-01; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080026269

The past success of lidar instruments in space combined with potentials of laser remote sensing techniques in improving

measurements traditionally performed by other instrument technologies and in enabling new measurements have expanded the role of lidar technology in future NASA missions. Compared with passive optical and active radar/microwave instruments, lidar systems produce substantially more accurate and precise data without reliance on natural light sources and with much greater spatial resolution. NASA pursues lidar technology not only as science instruments, providing atmospherics and surface topography data of Earth and other solar system bodies, but also as viable guidance and navigation sensors for space vehicles. This paper summarizes the current NASA lidar missions and describes the lidar systems being considered for deployment in space in the near future.
Author
Optical Radar; Spatial Resolution; Microwave Equipment; Navigation Instruments; Guidance Sensors; Laser Applications

20080026307 Yankee Group, Boston, MA, USA
Feasibility Study for a Wireless Fidelity (WiFi) Broadband National Network in Bosnia and Herzegovina
Feb. 2006; 136 pp.; In English
Report No.(s): PB2007-113663; No Copyright; Avail.: CASI: A07, Hardcopy

The objective of this feasibility study is to evaluate the deployment of a national broadband wireless fidelity (WiFi) network in Bosnia and Herzegovina. The objective of this study is to evaluate the technical and economic feasibility of deploying a national wireless broadband network using WiFi technologies. This study was designed to assist BH Telecom to determine how to best use wireless broadband technologies to extend low cost broadband Internet access and related services throughout major urban cities and to sparsely populated areas of Bosnia and Heregovina.
NTIS
Bosnia and Herzegovina; Broadband; Feasibility; Telecommunication; Wireless Communication

20080026327 Lucent Technologies Inc., Holmdel, NJ, USA
Distributed Scheduling in Wireless Networks with Service Differentiation
Gupta, P., Inventor; Sankarasubramaiam, Y., Inventor; Stolyar, A., Inventor; 25 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): NSF-CCR-03256736
Patent Info.: Filed Filed 25 Jun 04; US-Patent-Appl-SN-10-876-808
Report No.(s): PB2007-110123; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus includes a first node configured to transmit both data frames and requests for channel reservations to a local contention neighborhood of a network. The first node is configured to compete with other nodes of the neighborhood for reservations to the channel. The first node is configured to dynamically update a stored value of an access priority for the first node and to transmit said requests with a rate that depends on the stored value.
NTIS
Patent Applications; Scheduling; Wireless Communication

20080026329 California Univ., Berkeley, CA, USA
Self Organization of Wireless Sensor Networks Using Ultra-Wideband Radios
Dowla, F. U., Inventor; Nekoogar, F., Inventor; Spiridon, A., Inventor; 24 Jun 05; 11 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 24 Jun 05; US-Patent-Appl-SN-11-165-867
Report No.(s): PB2007-110122; No Copyright; Avail.: CASI: A03, Hardcopy

A novel UWB communications method and system that provides self-organization for wireless sensor networks is introduced. The self-organization is in terms of scalability, power conservation, channel estimation, and node synchronization in wireless sensor networks. The UWB receiver in the present invention adds two new tasks to conventional TR receivers. The two additional units are SNR enhancing unit and timing acquisition and tracking unit.
NTIS
Broadband; Patent Applications; Radio Equipment; Wideband Communication

20080029316 Rosenberg, Klein and Lee,, Ellicott City, MD, USA
Optical Wireless Networks with Adjustable Topologies
Davis, C. C., Inventor; Milner, S. D., Inventor; Smolyaninov, I. I., Inventor; 9 Jul 03; 23 pp.; In English
Contract(s)/Grant(s): DAAB0701CKZ17; AF-F306020020510

Patent Info.: Filed Filed 9 Jul 03; US-Patent-Appl-SN-10-615-182
Report No.(s): PB2007-110080; No Copyright; Avail.: CASI: A03, Hardcopy

In a free space communication network in which different communication nodes are linked together by directed beams, a method for dynamically configuring the topology of the network allows the transmission directions of the communication nodes to be autonomously changed to communicate with a new node as dictated by the needs of the network. Moreover, the nodes can be switched from directional to broadcast and back again on an as-needed basis. The network consists of a topology that can be rapidly and physically reconfigured as required to provide multiple connectivity, a desired quality of service, or to compensate with the loss of communication links between nodes. The loss of direct communication between any two nodes in an optical network can occur because of obscuration of the atmospheric path between the two nodes. The directed beam which provides the communication channel between the two nodes can, in this situation, be steered to direct its energy towards another accessible node.

NTIS

Adjusting; Optical Communication; Patent Applications; Topology

20080029330 National Telecommunications and Information Administration, Washington, DC USA

Assessment of Federal and Non-Federal Land Mobile Radio Frequency Assignment Methodologies

Joiner, B.; Paul, A.; Cai, K.; Drocella, E. F.; May 2007; 53 pp.; In English
Report No.(s): PB2007-112711; NTIA-RPT-07-447; No Copyright; Avail.: CASI: A04, Hardcopy

This report describes how the current frequency assignment process influences spectrum efficiency in the federal land mobile radio frequency bands. In light of the increasing demands for land mobile radio communications, federal spectrum managers must use frequency assignment methods that accurately represent interference to and from systems in the environment to ensure that spectrum is used efficiently. The results of this report will be used to support the implementation of an interference-based frequency assignment process that will improve spectrum efficiency. Standardizing the interference analysis methodologies used in identifying interference-free frequencies in the land mobile radio bands will also improve the overall effectiveness of the federal agencies in performing their missions. This report is one of a series of studies being performed by the National Telecommunications and Information Administration to develop techniques for evaluating and improving the efficiency and effectiveness of federal spectrum use in response to the President's Spectrum Policy Initiative. The results of these studies will be considered as a whole in setting future policies to improve federal spectrum efficiency.

NTIS

Frequency Assignment; Radio Equipment; Radio Frequencies

20080029331 Joint Spectrum Center, Annapolis, MD, USA

Communications Receiver Performance Degradation Handbook

Wheeler, D.; Canzona, N.; Nov. 2006; 155 pp.; In English
Contract(s)/Grant(s): DCA100-00-C-4012
Report No.(s): PB2007-112707; JSC-CR-06-072; No Copyright; Avail.: CASI: A08, Hardcopy

This handbook provides the radio frequency (RF) analyst with the capability to calculate the effects of noise and interference on RF communications receivers. A receiver is modeled as a sequence of modules. Each module has a transfer function that relates the module outputs to the module inputs. By consecutively analyzing each module in the sequence, the analyst can then relate the receiver outputs (performance) to the receiver inputs (signal characteristics).

NTIS

Degradation; Handbooks; Receivers

20080029337 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Signal Processing Method and System for Noise Removal and Signal Extraction

Fu, C. Y., Inventor; Petrich, L., Inventor; 31 May 05; 14 pp.; In English
Contract(s)/Grant(s): DOE-W-7405-ENG-48
Patent Info.: Filed Filed 31 May 05; US-Patent-Appl-SN-11-142-049
Report No.(s): PB2007-110625; No Copyright; Avail.: CASI: A03, Hardcopy

A signal processing method and system combining smooth level wavelet pre-processing together with artificial neural networks all in the wavelet domain for signal denoising and extraction. Upon receiving a signal corrupted with noise, an n-level decomposition of the signal is performed using a discrete wavelet transform to produce a smooth component and a rough component for each decomposition level. The n(sup)th level smooth component is then inputted into a corresponding

neural network pre-trained to filter out noise in that component by pattern recognition in the wavelet domain. Additional rough components, beginning at the highest level, may also be retained and inputted into corresponding neural networks pre-trained to filter out noise in those components also by pattern recognition in the wavelet domain. In any case, an inverse discrete wavelet transform is performed on the combined output from all the neural networks to recover a clean signal back in the time domain.
NTIS
Noise Reduction; Signal Processing; Wavelet Analysis; Neural Nets

20080029339 Whitham, Curtis and Christofferson, P.C., Reston, VA, USA
Cognitive Radio Engine Based on Genetic Algorithms in a Network
Rieser, C. J., Inventor; Rondeau, T. W., Inventor; Bostian, C., Inventor; Cyre, W. R., Inventor; Gallagher, T. M., Inventor; 25 Jun 04; 43 pp.; In English
Contract(s)/Grant(s): NSF-EIA-9983463; NSF-DGE-9987586
Patent Info.: Filed Filed 25 Jun 04; US-Patent-Appl-SN-10-875 619
Report No.(s): PB2007-113847; No Copyright; Avail.: CASI: A03, Hardcopy

A genetic algorithm (GA) approach is used to adapt a wireless radio to a changing environment. A cognitive radio engine implements three algorithms; a wireless channel genetic algorithm (WCGA), a cognitive system monitor (CSM) and a wireless system genetic algorithm (WSGA). A chaotic search with controllable boundaries allows the cognitive radio engine to seek out and discover unique solutions efficiently. By being able to control the search space by limiting the number of generations, crossover rates, mutation rates, fitness evaluations, etc., the cognitive system can ensure legal and regulatory compliance as well as efficient searches. The versatility of the cognitive process can be applied to any adaptive radio. The cognitive system defines the radio chromosome, where each gene represents a radio parameter such as transmit power, frequency, modulation, etc. The adaptation process of the WSGA is performed on the chromosomes to develop new values for each gene, which is then used to adapt the radio settings.
NTIS
Genetic Algorithms; Patent Applications

20080029345 Mulchinski (C. A.), El Segundo, CA, USA
Generalized Polyphase Channelization System
Kumar, R., Inventor; 9 Jun 04; 17 pp.; In English
Contract(s)/Grant(s): F04701-00-C-0009
Patent Info.: Filed Filed 9 Jun 04; US-Patent-Appl-SN-10-864-201
Report No.(s): PB2007-110690; No Copyright; Avail.: CASI: A03, Hardcopy

A computation efficient polyphase channelization system enables one of many user FDMA signals to be channelized through multiple FFT response frequency bands forming an aggregate frequency band where K-point FFT channels are greater than the decimation factor M to produce FFT overlapped responses that have a smooth aggregate response without disjointed band gaps for reduced distortion using a clockwise commutator having M channels feeding M filter blocks, each of which having .beta. polyphase filters, and having a ring switch to provide smooth filter responses that then drive .beta. K-point FFTs to provide a .beta. set of K vector FFT responses that are then combined in a post processing system for producing K channelized outputs.
NTIS
Computation; Patent Applications; Channels (Data Transmission)

20080029358 Bureau of the Census, Washington, DC, USA
Economic Census 1997: Establishment and Firm Size (Including Legal Form of Organization). Information. Subject Series
Oct. 2000; 105 pp.; In English
Report No.(s): PB2007-113982; EC97S51A-SZ; No Copyright; Avail.: CASI: A06, Hardcopy

The Information sector (sector 51) of the 1997 Economic Census comprises establishments engaged in the following processes: (a) producing and distributing information and cultural products,(b) providing the means to transmit or distribute these products as well as data or communications,and (c) processing data. The main components of this sector are the publishing industries, including software publishing, the motion picture and sound recording industries, the broadcasting and telecommunications industries, and the information services and data processing services industries. The expressions

information age and global information economy are used with considerable frequency today. The general idea of an information economy includes both the notion of industries primarily producing, processing,and distributing information,as well as the idea that every industry is using available information and information technology to reorganize and make themselves more productive. For the purpose of developing NAICS,it is the transformation of information into a commodity that is produced and distributed by a number of growing industries that is at issue. The Information sector groups three types of establishments: (1) those engaged in producing and distributing information and cultural products; (2) those that provide the means to transmit or distribute these products as well as data or communications; and (3) those that process data.
NTIS
Census; Economics; Industries; Information Systems

20080030123 Justice Research and Statistics Association, Washington, DC, USA
Bureau of Justice Assistance Evaluation Web Site. The First Year: An Annual Report, October 1999
Oct. 1999; 9 pp.; In English
Report No.(s): PB2007-112989; No Copyright; Avail.: CASI: A02, Hardcopy

In 1997, BJA formed a cooperative agreement with the Justice Research and Statistics Association (JRSA) to create an evaluation Web site. A planning group of evaluation experts, state planners, and local program managers was appointed as an advisor by BJA to assist with the planning and development of the Web site. When concluded, the framework for the Web site included: (1) an electronic roadmap for evaluation, (2) evaluation resources, (3) frequently asked questions, (4) state and local evaluation reports, (5) a site map, (6) a glossary of evaluation terms, and (7) a means to contact BJA. With this framework, staff from BJS and JRSA began gathering the relevant materials and building the electronic structure of the Web site. On August 5, 1998, the BJA Evaluation Web Site came on line for use, and it has continued to expand its materials and links to other relevant sites in order to provide state and local evaluators the fullest range of resources for their efforts.
NTIS
Internets; Websites; Evaluation

20080030196 NASA Goddard Space Flight Center, Greenbelt, MD, USA
James Webb Space Telescope - L2 Communications for Science Data Processing
Johns, Alan; Seaton, Bonita; Gal-Edd, Jonathan; Jones, Ronald; Fatig, Curtis; Wasiak, Francis; June 22, 2008; 7 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy

JWST is the first NASA mission at the second Lagrange point (L2) to identify the need for data rates higher than 10 megabits per second (Mbps). JWST will produce approximately 235 Gigabits of science data every day that will be downlinked to the Deep Space Network (DSN). To get the data rates desired required moving away from X-band frequencies to Ka-band frequencies. To accomplish this transition, the DSN is upgrading its infrastructure. This new range of frequencies are becoming the new standard for high data rate science missions at L2. With the new frequency range, the issues of alternatives antenna deployment, off nominal scenarios, NASA implementation of the Ka-band 26 GHz, and navigation requirements will be discussed in this paper. JWST is also using Consultative Committee for Space Data Systems (CCSDS) standard process for reliable file transfer using CCSDS File Delivery Protocol (CFDP). For JWST the use of the CFDP protocol provides level zero processing at the DSN site. This paper will address NASA implementations of Ground Stations in support of Ka-band 26 GHz and lesson learned from implementing a file base (CFDP) protocol operational system.
Author
James Webb Space Telescope; Frequency Ranges; Superhigh Frequencies; Rates (Per Time); Aerospace Systems

20080030373 NASA Glenn Research Center, Cleveland, OH, USA
Using COMSOL Multiphysics Software to Model Anisotropic Dielectric and Metamaterial Effects in Folded-Waveguide Traveling-Wave Tube Slow-Wave Circuits
Starinshak, David P.; Smith, Nathan D.; Wilson, Jeffrey D.; July 2008; 9 pp.; In English; Ninth International Vacuum Electronics Conference (IVEC 2008), 22-24 Apr. 2008, Monterey, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 698671.01.03.45; WBS 526282.01.03.02.03.04
Report No.(s): NASA/TM-2008-215267; P1.35; E-16537; Copyright; Avail.: CASI: A02, Hardcopy

The electromagnetic effects of conventional dielectrics, anisotropic dielectrics, and metamaterials were modeled in a terahertz-frequency folded-waveguide slow-wave circuit. Results of attempts to utilize these materials to increase efficiency are presented.
Author
Dielectrics; Wave Propagation; Anisotropy; Finite Element Method; Dielectric Properties

20080030474 Naval Postgraduate School, Monterey, CA USA
The Survival of the Company Man in Iraq
Phillips, Kyle S; Mar 2008; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479885; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479885

This thesis examines the decision-making processes used by company grade officers operating in combat roles in Iraq and seeks to determine if innovation largely originates among lower ranking officers. The author analyzes the incentives structure and the command climate of the U.S. Army in Iraq and how officers operate within this environment. Interviews with officers who served in Iraq illuminate the motivations for innovation. The thesis identifies the many obstacles that officers encounter in attempting to 'innovate from below.'
DTIC
Command and Control; Decision Making; Iraq; Organizations; Survival

20080030572 Naval Postgraduate School, Monterey, CA USA
Information Management Utilizing Valued Information at the Right Time (VIRT) as Applied to a Joint Terminal Attack Controller (JTAC) Mission
Morris, Jason T; Mar 2008; 77 pp.; In English
Report No.(s): AD-A479969; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research utilizes the JTAC mission and applies the VIRT concept of smart-push information delivery. Current efforts within DoD focus on achieving a virtual world where all information becomes available through the GIG. This smart pull approach to information delivery does not adequately address the value of information and the absolute requirement to deliver it to the lowest levels when and where needed. The current DoD enterprise wide mentality of IT implementation does not focus on where best to leverage IT in order to achieve an immediate increase in capability. VIRT, as demonstrated in this research, provides an excellent place to start and a great opportunity to utilize technology in an effective way without taking a decade for implementation.
DTIC
Communication Networks; Controllers; Data Processing Terminals; Information Management; Management Information Systems; Support Systems; Warfare

20080030582 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Automated Speech Intelligibility System for Head-Borne Personal Protective Equipment: Proof of Concept
Coyne, Karen M; Barker, Daniel J; Eshbaugh, Jonathan P; Apr 2008; 20 pp.; In English
Contract(s)/Grant(s): Proj-7NBN2F
Report No.(s): AD-A480001; ECBC-TR-616; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An automated objective test system was developed to assess the impact of head-borne personal protective equipment on speech intelligibility and transmission. The system comprised talker and listener headforms, speech recordings, and speech recognition software. A recording of sentences from the Speech Perception in Noise test was transmitted from the speaker in the talker headform to microphones in the ears of the listener headform. The speech recognition software recorded the speech received at the listener headform. The responses were scored by hand. Speech transmission was assessed by separately placing two air-purifying respirators on the talker headform while speech intelligibility was evaluated by separately placing a chemical protective suit, an escape respirator with hood, and a ballistic helmet on the listener headform. A control condition with bareheaded talker and listener headforms was run for comparison. Speech transmission was statistically significantly degraded by both respirator conditions compared to the control condition. The protective suit and escape respirator both caused statistically significant decreases in speech intelligibility compared to the control and helmet conditions. These results show that an automated test system has been developed that can be used to quantify degradations in speech transmission and intelligibility when head-borne personal protective equipment is worn.
DTIC
Computer Programs; Intelligibility; Masks

20080030617 Naval Postgraduate School, Monterey, CA USA
'Someone to Watch Over Me?' Privacy and Governance Strategies for CCTV and Emerging Surveillance Technologies
Zoufal, Donald R; Mar 2008; 215 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Responding to concerns of terror around the world, law enforcement agencies are rapidly moving to utilize a range of

surveillance technologies to address the threat. While the lead technology in this area is closed circuit television (CCTV), other technologies like radio frequency identification (RFID), global positioning satellite (GPS) technology and biometrics are also being expanded for use in monitoring human activity. These systems share common features and can be interrelated and controlled with developing computer technologies. They can also be used by government for a range of other purposes. However, use of these technologies has implications for individual privacy. This research examines the nature of privacy and existing legal protections. It also investigates a range of approaches to govern the use of these developing technologies. It is a critical governmental function to administer the use of that technology to ensure that it is related to appropriate government purposes and that individual civil rights are protected. To be successful, that governance scheme will have to address key privacy concerns while remaining flexible enough to adapt to changing technology. Informed by this research policymakers will be better able to develop effective governance strategies.
DTIC
Closed Circuit Television; Law (Jurisprudence); Privacy; Surveillance

20080030636 Army War Coll., Carlisle Barracks, PA USA
Command and Control Organizations for Network Enabled Warfare
Huber, Francis J; Mar 25, 2008; 29 pp.; In English
Report No.(s): AD-A480155; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The current US Army command and control headquarters organizations are based upon staff structures that have been in use since the beginning of the 20th Century. These organizations are relatively duplicative and rigid in order to be survivable before robust and redundant communications were the norm. Current Command and Control (C2) systems and technologies have been overlaid on these legacy organizations without altering the fundamentals of their operation. Business practices show that 'horizontal organizations' can produce high performing teams that rapidly solve problems and vastly decrease decision cycles for business organizations. Military organizations have a unique problem set, but it is possible to bring the applicable parts of horizontal organizations into the military structure to gain the same advantages provided by networked systems Moving to a more networked structure will require a carefully developed strategy to overcome natural caution and resistance to change A well formulated strategy with well placed leadership support can produce organizations that are flexible, adaptive and responsive to meet the command and control needs of the 21st century army
DTIC
Command and Control; Organizations; Warfare

20080030666 Naval Postgraduate School, Monterey, CA USA
Performance Analysis of an Alternative Link-16/JTIDS Waveform Transmitted Over a Channel with Pulse-Noise Interference
Cham, Kok Kiang; Mar 2008; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480342; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Joint Tactical Information Distribution System (JTIDS) is a hybrid frequency-hopped, direct sequence spectrum system that utilizes a (31, 15) Reed-Solomon (RS) code and cyclical code-shift keying modulation for the data packets, where each encoded symbol consists of five bits. The primary drawback to JTIDS is the limited data rate. In this thesis, an alternative waveform consistent with the existing JTIDS channel waveform but with a two-fold increase in data rate is analyzed. The system to be considered uses (31,15) RS encoding as in the original JTIDS, but each pair of five-bit symbols at the output of the Reed-Solomon encoder undergo serial-to-parallel conversion to two five-bit symbols, which are then independently transmitted on the in-phase and quadrature components of the carrier using 32-ary biorthogonal keying with a diversity of two. The performance obtained with the alternative waveform is compared with that obtained for the existing JTIDS waveform for the relatively benign case where additive white Gaussian noise is the only noise present as well as when pulse-noise interference (PNI) is present. Errors-and-erasures decoding as well as errors-only decoding is considered. Based on the analyses, we see that the proposed alternative JITDS/Link- 16 waveform performs better in AWGN as well as when PNI is present. No significant advantage is obtained using EED for the alternative waveform. There is a significant improvement in performance when perfect-side information is assumed.
DTIC
Data Links; Information Systems; Rates (Per Time); Reliability Analysis; Waveforms

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*.

20080026312 TIAX, LLC, Cambridge, MA, USA
Products to Enhance the Market Penetration of High Performance Commercial Buildings
Rhodes, T.; Brekken, M.; Roth, K. W.; Oct. 2006; 127 pp.; In English
Contract(s)/Grant(s): DE-AD26-04NT40810
Report No.(s): PB2007-100017; TIAX-D-0279; No Copyright; Avail.: National Technical Information Service (NTIS)

Commercial buildings consume a large portion of our nation's energy resources. Each year, the U.S. consumes about 100 quads of energy (100 x 10(sup 15) BTU's). About 17.5 quads of that energy are consumed by commercial buildings at an annual cost to consumers of approximately $130 billion. The U.S. Department of Energy, Building Technologies Program (DOE/BT) performs research and development on integrated buildings, crosscutting technologies, and building energy analysis software. Presently, the core concept of the commercial R&D program is High Performance Buildings (HPB's), buildings that employ a suite of technologies to achieve low levels of energy use. A HPB consumes at least 50% less energy than a minimally code-compliant building. In addition, DOE/B T's long-range goal of Zero Energy Buildings considers activities that go beyond incremental advances, toward maximum achievable performance levels.
NTIS
Buildings; Penetration

20080026320 Schwegman, Lundberg, Woessner and Kluth, Minneapolis, Macau
Measurement Systems and Methods
Horkay, F., Inventor; Basser, P., Inventor; Berman, A., Inventor; 28 Jan 05; 11 pp.; In English
Patent Info.: Filed Filed 28 Jan 05; US-Patent-Appl-SN-11-046-199
Report No.(s): PB2007-110525; No Copyright; Avail.: CASI: A03, Hardcopy

A measurement system including a staging unit including a substrate having piezoelectric properties and a conductive electrode formed on the substrate, the conductive electrode including an area adapted to receive a sample, and an oscillator coupled to the conductive electrode. A method including in a tissue sample having a mass of less than about one microgram and that exerts a high osmotic pressure, calculating an osmotic pressure value for the tissue sample from a plurality of measurements of changes in the mass due to swelling.
NTIS
Electrodes; Patent Applications; Measurement

20080026333 Brookhaven National Lab., Upton, NY USA
Method and Apparatus for Linear Low-Frequency Feedback in Monolithic Low-Noise Charge Amplifiers
DeGeronimo, G., Inventor; 14 Jun 04; 20 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Patent Info.: Filed Filed 14 Jun 04; US-Patent-Appl-SN-10-866-441
Report No.(s): PB2007-110687; No Copyright; Avail.: CASI: A03, Hardcopy

A charge amplifier includes an amplifier, feedback circuit, and cancellation circuit. The feedback circuit includes a capacitor, inverter, and current mirror. The capacitor is coupled across the signal amplifier, the inverter is coupled to the output of the signal amplifier, and the current mirror is coupled to the input of the signal amplifier. The cancellation circuit is coupled to the output of the signal amplifier. A method of charge amplification includes providing a signal amplifier; coupling a first capacitor 10 across the signal amplifier; coupling an inverter to the output of the signal amplifier; coupling a current mirror to the input of the signal amplifier; and coupling a cancellation circuit to the output of the signal amplifier. A front-end system for use with radiation sensors includes a charge amplifier and a current amplifier, shaping amplifier, baseline stabilizer, discriminator, peak detector, timing detector, and logic circuit coupled to the charge amplifier.
NTIS
Feedback; Low Frequencies; Low Noise

20080029297 Nevada Univ., Las Vegas, NV, USA
Next-Generation Mega-Voltage Cargo-Imaging System for Cargo Container Inspection
Mar. 2007; 20 pp.; In English
Report No.(s): DE2007-901325; No Copyright; Avail.: National Technical Information Service (NTIS)

The UNLV Research Foundation, as the primary award recipient, teamed with Varian Medical Systems-Security & Inspection Products and the University of Nevada Las Vegas (UNLV) for the purpose of conducting research and engineering related to a 'next-generation' mega-voltage imaging (MVCI) system for inspection of cargo in large containers. The procurement and build-out of hardware for the MVCI project has been completed. The K-9 linear accelerator and an optimized X-ray detection system capable of efficiently detecting X-rays emitted from the accelerator after they have passed through the device is under test. The Office of Science financial assistance award has made possible the development of a system utilizing a technology which will have a profound positive impact on the security of U.S. seaports. The proposed project will ultimately result in critical research and development advances for the 'next-generation' Linatron X-ray accelerator technology, thereby providing a safe, reliable and efficient fixed and mobile cargo inspection system, which will very significantly increase the fraction of cargo containers undergoing reliable inspection as the enter U.S. ports. Both NNSA/NA-22 and the Department of Homeland Security's Domestic Nuclear Detection Office are collaborating with UNLV and its team to make this technology available as soon as possible.
NTIS
Cargo; Electric Potential; Imaging Techniques; Inspection

20080029304 Patent Docket Administration, El Segundo, CA, USA
Passive Thermal Switch
Dietz, D. W., Inventor; Moe, L. C., Inventor; Valmidiano, L. O., Inventor; Franklin, M. R., Inventor; Chiang, T. C., Inventor; 10 Jun 04; 13 pp.; In English
Contract(s)/Grant(s): DAAH01-00-C-0107
Patent Info.: Filed Filed 10 Jun 04; US-Patent-Appl-SN-10-866-224
Report No.(s): PB2007-110686; No Copyright; Avail.: CASI: A03, Hardcopy

A thermal switch selectively couples a heat source to a pair of heat sinks. The thermal switch includes a shunt that is thermally coupled to the heat source. The shunt has a pair of posts. End portions of the posts are at least partially radially surrounded by respective cups. The cups in turn are thermally coupled to respective of the heat sinks. The cups are made of a material with a larger coefficient of thermal expansion than the material of the posts. Activation of one of the heat sinks causes the cup corresponding to that heat sink to contract, bringing it into contact with the corresponding post of the shunt. This opens a heat path through the switch from the heat source to the activated heat sink. Thermal isolation of the second cup is facilitated by an axial isolator of high thermal impedance, facilitating isolation of the inactive heat sink.
NTIS
Heat Sinks; Switches; Temperature Control

20080029306 Maine and Asmus, Nashua, NH, USA; BAE Systems and Technology, Nashua, NH, USA
Automatic Integration Reset Offset Subtraction Circuit
Hairston, A. W., Inventor; 15 Jun 04; 11 pp.; In English
Contract(s)/Grant(s): DSWA01-98-C-0186
Patent Info.: Filed Filed 15 Jun 04; US-Patent-Appl-SN-10-868-429
Report No.(s): PB2007-110683; No Copyright; Avail.: CASI: A03, Hardcopy

Techniques for precise removal of offset charge associated with the reset switch of an integration circuit are disclosed. Offset cancellation circuitry includes a single reset offset subtraction circuit and a replica integrator, which is configured identically to the integrators to be offset cancelled. An offset charge is generated by the circuitry and capacitively coupled to the target integrators. This generated offset charge causes voltage at the input node of each target integrator to substantially match the desired starting voltage level of the targeted integration process. Minimal additional space and circuitry is needed. All of the undesired offset charge is cancelled, without canceling any of the desired input current.
NTIS
Cancellation; Circuits; Switches

20080029312 UT-Battelle, LLC, Oak Ridge, TN, USA
Robust, Self-Aligning, Low-Cost Connector for Large Core Optical Waveguides
Maxey, L. C., Inventor; 25 Jun 04; 4 pp.; In English
Contract(s)/Grant(s): DE-AC05000R-22725

Patent Info.: Filed Filed 25 Jun 04; US-Patent-Appl-SN-10-876-391
Report No.(s): PB2007-110118; No Copyright; Avail.: CASI: A01, Hardcopy

The optical waveguide connector comprises at least two optical waveguides abutting at a joint, the waveguides having a diameter variance in a predetermined range; a cover at least partially enclosing at least two optical waveguides, the cover having a first end, a second end, and an interior annular space; a collet proximate each first end and second end of the cover and removably coupled to an optical waveguide; and a sleeve removably abutting each collet and circumferentially surrounding the cover and each collet.

NTIS

Connectors; Low Cost; Optical Waveguides; Patent Applications; Self Alignment

20080029333 Los Alamos National Lab., NM USA

Semiconductor Nanocrystal Quantum Dots and Metallic Nanocrystals as UV Blockers and Colorants for Sunscreens and/or Sunless Tanning Compositions

Hollingsworth, J. A., Inventor; Klimov, V. I., Inventor; Anikeeva, P. O., Inventor; 28 May 04; 15 pp.; In English
Contract(s)/Grant(s): DE-W-7405-36
Patent Info.: Filed Filed 28 May 04; US-Patent-Appl-SN-10-857-583
Report No.(s): PB2007-110631; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention is directed to photostable sunscreen and/or artificial tanning compositions including quantum dot nanocrystals of a material selected from semiconductor nanocrystals, modified semiconductor nanocrystals, multicomponent semiconductor/semiconductor nanocrystals, and hybrid semiconductor/metal nanocrystals, the quantum dot nanocrystals having an absorption band gap occurring at wavelengths higher than 400 nm whereby the quantum dot nanocrystals have substantial broadband absorption properties of ultraviolet light at wavelengths across the range of both UV-A (320-400 nm) and UV-B (280-320 nm), and a dermatologically acceptable carrier for the quantum dot nanocrystals. The present invention is further directed to photostable sunscreen and/or artificial tanning compositions including a material selected from metallic nanocrystals, multicomponent metal/metal nanocrystals, and alloyed metal nanocrystals, the metallic material having a surface plasmon resonance occurring sufficiently into the visible or infrared spectral region whereby broad absorption features due to electronic transitions, the broad absorption features located at higher energies, provide substantial broadband absorption properties of ultraviolet light at wavelengths across the range of both UV-A (320-400 nm) and UV-B (280-320 nm), and a dermatologically acceptable carrier for the metallic material.

NTIS

Nanocrystals; Quantum Dots; Semiconductors (Materials); Metals

20080029335 Smith (Joseph H.), San Jose, CA, USA

X-Ray Tomography and Laminography

Gary, C. K., Inventor; 7 Jan 05; 21 pp.; In English
Contract(s)/Grant(s): NSF-0319668
Patent Info.: Filed Filed 7 Jan 05; US-Patent-Appl-SN-11-031-650
Report No.(s): PB2007-110627; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for imaging objects with x-rays using an x-ray tube, refractive x-ray lens and area detector. Cross sectional images of individual planes within an object are achieved through tomographic and laminographic exposure and image processing. The use of refractive x-ray lenses to achieve high resolution eliminates the need for vanishingly small microspot x-ray sources to achieve high resolution that current x-ray tomographic and laminographic systems suffer.

NTIS

Tomography; X Ray Sources; X Rays; Image Processing

20080029346 Stockton (Kilpatrick), LLP, Atlanta, GA, USA

Products and Processes for Providing Haptic Feedback in Resistive Interface Devices

Olien, N. T., Inventor; Gregorio, P., Inventor; 27 May 04; 11 pp.; In English
Contract(s)/Grant(s): NSF-DMII-0091589
Patent Info.: Filed Filed 27 May 04; US-Patent-Appl-SN-10-855-902
Report No.(s): PB2007-110689; No Copyright; Avail.: CASI: A03, Hardcopy

Products and processes for providing haptic feedback in a user interface are disclosed. One exemplary embodiment of an apparatus comprises a first element comprising a first surface, a second element comprising a second surface, and an actuator

configured vary a force between the first and second surfaces. In one embodiment, the second element may be configured to be displaced relative to first element in a degree of freedom. In another embodiment, at least one of the first surface and the second surface may comprise a thermoplastic polymer.
NTIS
Feedback; Patent Applications; Touch

20080029858 NASA Johnson Space Center, Houston, TX, USA
Lithium-Ion Performance and Abuse Evaluation Using Lithium Technologies 9Ah cell
Hall, Albert Daniel; Jeevarajan, Judith A.; May 06, 2006; 4 pp.; In English; 42nd Power Sources Conference, 12-15 Jun. 2006, Philadelphia, PA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Lithium-ion batteries in a pouch form offer high energy density and safety in their designs and more recently they are offering performance at higher rates. Lithium Technologies 9Ah high-power pouch cells were studied at different rates, thermal environments, under vacuum and several different conditions of abuse including overcharge, over-discharge and external short circuit. Results of this study will be presented.
Author
Lithium Batteries; Electrical Engineering

20080029990 Perot Systems Corp., Greenbelt, MD, USA
Scintillation Breakdowns in Chip Tantalum Capacitors
Teverovsky, Alexander; September 09, 2008; 11 pp.; In English; Electronic Devices and Systems IMAPS CS International Conference, 10-11 Sep. 2008, Brno, Czech Republic; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080029990

Scintillations in solid tantalum capacitors are momentarily local breakdowns terminated by a self-healing or conversion to a high-resistive state of the manganese oxide cathode. This conversion effectively caps the defective area of the tantalum pentoxide dielectric and prevents short-circuit failures. Typically, this type of breakdown has no immediate catastrophic consequences and is often considered as nuisance rather than a failure. Scintillation breakdowns likely do not affect failures of parts under surge current conditions, and so-called 'proofing' of tantalum chip capacitors, which is a controllable exposure of the part after soldering to voltages slightly higher than the operating voltage to verify that possible scintillations are self-healed, has been shown to improve the quality of the parts. However, no in-depth studies of the effect of scintillations on reliability of tantalum capacitors have been performed so far. KEMET is using scintillation breakdown testing as a tool for assessing process improvements and to compare quality of different manufacturing lots. Nevertheless, the relationship between failures and scintillation breakdowns is not clear, and this test is not considered as suitable for lot acceptance testing. In this work, scintillation breakdowns in different military-graded and commercial tantalum capacitors were characterized and related to the rated voltages and to life test failures. A model for assessment of times to failure, based on distributions of breakdown voltages, and accelerating factors of life testing are discussed.
Derived from text
Capacitors; Failure; Scintillation; Tantalum

20080030130 Geological Survey, Flagstaff, AZ, USA; SWCA, Inc., Tucson, AZ, USA; San Diego Natural History Museum, San Diego, CA, USA
Assessing Variation of Plumage Coloration with the Willow Flycatcher: A Preliminary Analysis
Paxton, E. H.; Causey, C. F.; Koronkiewicz, T. J.; Sogge, M. K.; Johnson, M. J.; January 2005; 14 pp.; In English
Report No.(s): PB2007-113156; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a preliminary analysis evaluating the potential use of a Minolta Colorimeter to quantify plumage coloration variation in the Willow Flycatcher. A colorimeter is a device that measures the color of an object, such as a birds plumage, and produces a standardized value that can be analyzed statistically. Over the 2004 breeding season, we captured and measured 93 Willow Flycatchers of three subspecies at seven sites, and measured the plumage coloration on the head and the back. Although the resulting dataset was limited in terms of geographic distribution and sample size, preliminary analysis revealed that the colorimeter can detect substantial plumage variation within the Willow Flycatcher subspecies, and significant differences among the subspecies. Furthermore, preliminary modeling suggests colorimeters have the potential to be a

powerful tool in assigning subspecies status to individuals of unknown origin (i.e., migrants, wintering flycatchers), but additional sampling is needed before it can be used for this purpose.
NTIS
Color; Plumage; Standardization

20080030136 Troutman Sanders , LLP, Atlanta, GA, USA; Georgia Tech Research Corp., Atlanta, GA, USA
Lead-Free Bonding Systems
Aggarwal, A., Inventor; Abothu, I. R., Inventor; Raj, P. M., Inventor; Tummala, R. R., Inventor; 26 May 05; 20 pp.; In English
Contract(s)/Grant(s): NSF-EEC-9402723
Patent Info.: Filed Filed 26 May 05; US-Patent-Appl-SN-11-138-011
Report No.(s): PB2007-110674; No Copyright; Avail.: CASI: A03, Hardcopy

Nano-structured interconnect formation and a reworkable bonding process using solder films. Large area fabrication of nano-structured interconnects is demonstrated at a very fine pitch. This technology can be used for pushing the limits of current flip chip bonding in terms of pitch, number of I/Os, superior combination of electrical and mechanical properties as well as reworkability. Sol-gel and electroless processes were developed to demonstrate film bonding interfaces between metallic pads and nano interconnects. Solution-derived nano-solder technology is an attractive low-cost method for several applications such as MEMS hermetic packaging, compliant interconnect bonding and bump-less nano-interconnects.
NTIS
Bonding; Patent Applications; Solders

20080030252 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recent Results on the Accurate Measurements of the Dielectric Constant of Seawater at 1.413GHZ
Lang, R.H.; Tarkocin, Y.; Utku, C.; Le Vine, D.M.; July 07, 2008; 4 pp.; In English; IGARSS 08, 7-11 Jul. 2008, Boston, MA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Measurements of the complex. dielectric constant of seawater at 30.00 psu, 35.00 psu and 38.27 psu over the temperature range from 5 C to 3 5 at 1.413 GHz are given and compared with the Klein-Swift results. A resonant cavity technique is used. The calibration constant used in the cavity perturbation formulas is determined experimentally using methanol and ethanediol (ethylene glycol) as reference liquids. Analysis of the data shows that the measurements are accurate to better than 1.0% in almost all cases studied.
Author
Ethylene Compounds; Glycols; Methyl Alcohol; Perturbation; Permittivity

20080030470 Naval Postgraduate School, Monterey, CA USA
Field Programmable Gate Array Control of Power Systems in Graduate Student Laboratories
O'Connor, Joseph E; Mar 2008; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479877; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479877

The Department of Electrical and Computer Engineering at the Naval Postgraduate School (NPS) continuously develops new design and education resources for students. One area of focus for students in the Power Electronics curriculum track is the development of a design center that explores Field Programmable Gate Array (FPGA) control of power electronics. Utilizing Mathworks(trademark) and XILINX(trademark) software to interface the FPGA with power converters, students gain experience with digital design, simulation, and hardware testing. This thesis focuses on the design, implementation and testing of a Student Design Center (SDC) employing an FPGA based digital controller. This thesis especially concentrates on the hardware interface between the FPGA and the power electronics and the development of laboratory procedures for students utilizing the design center.
DTIC
Computer Aided Design; Controllers; Electric Potential; Field-Programmable Gate Arrays; Students

20080030563 Department of the Navy, Washington, DC USA
Hydraulic Circuit for Prevention of Inadvertent Weapon Launches
Ansay, Michael T, Inventor; Aug 2, 2006; 18 pp.; In English
Report No.(s): AD-D020360; No Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/100.2/ADD020360

A hydraulic circuit for prevention of inadvertent weapons launches in which a hydraulic firing valve provides hydraulic

pressure to a backup select valve rather than the backup select valve receiving hydraulic pressure directly from a ship supply header. This hydraulic pressure shifts the backup select valve to allow hydraulic pressure to pass to a mode select control valve that actuates a controllable air-firing valve, until a hydraulic firing valve for the weapon is opened. The backup select valve actuation can only occur with the initiation of the hydraulic firing valve. Only after the hydraulic firing valve is open, does the backup select valve initiate hydraulic pressure to the mode select control valve thereby preventing hydraulic actuation of the backup select valve.
DTIC
Actuators; Circuits; Hydraulic Equipment; Launching; Prevention

20080030659 Sachs/Freeman Associates, Inc., Crofton, MD USA
Electronics Devices and Materials
Jackson, Eric; Kornegay, Connie; Lorentzen, Justin; Messenger, Scott; Rebbert, Milton; Hite, Jennifer; Marshall, Paul; Neilson, John; Mar 17, 2008; 21 pp.; In English
Contract(s)/Grant(s): N00173-00-D-2000
Report No.(s): AD-A480302; SFA007A; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the past year, SFA, Inc., has conducted a broad range of research in the Naval Research Laboratory's (NRL) Electronics Science and Technology Division. This research was both theoretical and experimental involving the development of analytical, fabrication, diagnostic and characterization techniques. Several areas were emphasized: solid state electronics, semiconductor materials, biochemical sensors, opto-electronics, and a special emphasis was placed on silicon, III-V compound semiconductors, reliability physics of electronic devices and the hardening and vulnerability assessment of electronic devices.
DTIC
Electronic Equipment; Solid State

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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*.

20080026323 Taylor, Porter, Brooks and Phillips, L.L.P, Baton Rouge, LA, USA
Crossflow Micro Heat Exchanger
Kelly, K. W., Inventor; Harris, C. R., Inventor; Despa, M. S., Inventor; 20 Apr 05; 22 pp.; In English
Contract(s)/Grant(s): DARPA-DABT63-95-C-0020
Patent Info.: Filed Filed 20 Apr 05; US-Patent-Appl-SN-11-110-113
Report No.(s): PB2007-110522; No Copyright; Avail.: CASI: A03, Hardcopy

An extremely high efficiency, cross flow, fluid-fluid, micro heat exchanger and novel method of fabrication using electrode-less deposition is disclosed. To concurrently achieve the goals of high mass flow rate, low pressure drop, and high heat transfer rates, the heat exchanger comprises numerous parallel, but relatively short microchannels. Typical channel heights are from a few hundred micrometers to about 2000 micrometers, and typical channel widths are from around 50 micrometers to a few hundred micrometers. The micro heat exchangers offer substantial advantages over conventional, larger heat exchangers in performance, weight, size, and cost. The heat exchangers are especially useful for enhancing gas-side heat exchange. The use of microchannels in a cross-flow micro-heat exchanger decreases the thermal diffusion lengths substantially, allowing substantially greater heat transfer per unit volume or per unit mass than has been achieved with prior heat exchangers.
NTIS
Cross Flow; Heat Exchangers; Patent Applications

20080026334 NASA Langley Research Center, Hampton, VA, USA
CFD Simulation of Square Cross-Section, Contoured Nozzle Flows: Comparison with Data
Ostrander, Mark J.; Thomas, Scott R.; Voland, Randall T.; Guy, Robert W.; Srinivasan, Shivakumar; January 09, 1989; 17 pp.; In English; 27th Aerospace Sciences Meeting, 9-12 Jan. 1989, Reno, NV, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-89-0045; Copyright; Avail.: CASI: A03, Hardcopy

Computational analyses have been made of the flow in NASA Langley's Arc-Heated Scramjet Test Facility's Mach 4.7 and Mach 6 square crosssection contoured nozzles for comparison with experimental results. The analyses, which were

performed using a 3-D RANS computer code assuming a single species gas with constant specific heats, were intended to provide insight into the nature of the flow development in this type of nozzle. The computational results showed the exit flow distribution to be affected by counter-rotating vortices along the centerline of each nozzle sidewall. Calculated flow properties show general, but not complete, agreement with experimental measurements in both nozzles.
Author
Computational Fluid Dynamics; Contours; Simulation; Nozzle Flow; Arc Heating; Cross Sections; Data Processing; Nozzle Design; Numerical Analysis; Hypersonic Speed

20080026355 NASA Ames Research Center, Moffett Field, CA, USA
Computational Requirements for Hypersonic Flight Performance Estimates
Mehta, Unmeel B.; June 12, 1989; 18 pp.; In English; AIAA 24th Thermophysics Conference, 12-14 Jun. 1989, Buffalo, NY, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-89-1670; Copyright; Avail.: CASI: A03, Hardcopy

Among the many new hypervelocity vehicles being considered for development, the air-breathing, single stage to orbit (SSTO) trans atmospheric vehicles (TAVs) and aeroassisted orbital-transfer vehicles (AOTVs) are going to be designed largely by computational fluid dynamics (CFD). Errors in CFD, flight-performance estimates, and consequently, those in the specification of these vehicles need to be sufficiently small for achieving design goals set for them. At present, the credibility of the CFD technology utilizing different forms of the Navier-Stokes equations for estimating critical design-performance quantitiesis,in general,poor. To improve this credibility, the development of CFD design technology for these vehicles requires 'programmatic research.' Performance estimates are emphasized; and the CFD design technology development triad and 'code certification' are introduced. Performance estimation requirements largely determine the computational requirements. This triad uses the systems approach to create a strong interaction between CFD, design, ground-based testing, and flight testing. Code certification attempts to bring order into the process of establishing credibility of computer codes. The requirements of code certification are primarily set by design sensitivities and physical/chemical realities observed in experiments. Ground-based experiments and flight tests help to establish the credibility of CFD results. However, risks are associated with CFD performance estimates mainly because of a lack of quality test data, inadequate modeling of physics and chemistry, and a lack of a satisfactory level of numerical accuracy. These risks need to be estimated with an uncertainty analysis. The above CFD design technology development process (the emphasis, the triad, and code certification) is applicable to all speed regimes, not only to the hypersonic speed regime.
Author
Computational Fluid Dynamics; Hypersonic Flight; Aeroassist; Hypersonic Speed; Transatmospheric Vehicles; Flight Tests; Flight Characteristics

20080026356 General Applied Science Labs., Inc., Ronkonkoma, NY, USA
Use of an Expansion Tube to Examine Scramjet Combustion at Hypersonic Velocities
Rizkalla, Oussama; Bakos, Robert J.; Chinitz, Wallace; Pulsonetti, Maria V; Erdos, John I.; July 10, 1989; 15 pp.; In English; AIAA/ASME/SAE/ASEE 25th Joint Propulsion Conference, 10-12 Jul. 1989, Monterey, CA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NAS1-18450; F33657-89-D-2048
Report No.(s): AIAA Paper-89-2536; Copyright; Avail.: Other Sources

Combustion testing at total enthalpy conditions corresponding to flight Math numbers in excess of 12 requires the use of impulse facilities. The expansion tube is the only operational facility of its size which can provide these conditions without excessive oxygen dissociation or driver gas contamination. Expansio tube operation is described herein and the operational parameters having the largest impact on its performance are determined. These are: driver-to-intermediate chamber pressure ratio, driver gas molecular weight and specific heat ratio, and driver gas temperature. Increases in the lase named parameter will markedly affect the test section static pressure. Preliminary calibration tests are discussed and test gas conditions which have been achieved are presented. Calculated and experimental test times are compared and the parameters affecting test time are discussed. The direction of future work using this important experimental tool is indicated.
Author
Supersonic Combustion Ramjet Engines; Expansion; Hypersonic Speed; Test Facilities; Supersonic Wind Tunnels; Shock Tubes

20080026358 Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH, USA

National Aero-Space Plane Project Overview

Horton, Don; July 20, 1989; 9 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper-89-5002; Copyright; Avail.: CASI: A02, Hardcopy

The National Aero-Space Plane (NASP) program, from a projects standpoint, can really be broken down into two major areas: management and technical advances. While anyone familiar with the NISP program knows of the technical challenges, we consider the management challenges to be equally important to the successful development of the National AeroSpace Plane. The present management strategy and a history of the NASP project management will be covered, as well as looking at the major technical challenges of hypersonic flight faced by the program. The progress to date will be discussed and the plans for the successful completion of Phase 2 will be presented. The challenges of the NASP program have dictated a different approach to management and technology development. The magnitude of the problem can be seen when you consider there are over 5000 people working on the present program, representing almost every state in the USA, and the hundreds of companies and universities involved with the technology development. In addition to this, almost every piece of the airplane is a major technical challenge. The management of multiple high risk technologies spread among multiple organizations has posed unique management and technical challenges.

Author

National Aerospace Plane Program; Project Management; General Overviews; Technology Utilization

20080029273 General Applied Science Labs., Inc., Ronkonkoma, NY, USA

Hypersonic Mixing and Combustion Studies in the GASL HYPULSE Facility

Bakos, R. J.; Tamagno, J.; Rizkalla, O.; Pulsonetti, M. V.; Chinitz, W.; Erdos, J. I.; July 16, 1990; 14 pp.; In English; AIAA/SAE/ASME/ASEE 26th Joint Propulsion Conference, 16-18 Jul. 1990, Orlando, FL, USA; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 2.2.21

Report No.(s): AIAA Paper 90-2095; Copyright; Avail.: Other Sources

Hydrogen-air mixing and combustion experiments at air velocities approaching 17,000 ft/s have been conducted in the expansion tube in CASL's HYPULSE facility. The data were obtained in the facility's sub-millisecond steady flow test period. The results proved to be repeatable and indicated increasing extent of reaction as the fuel-air ratio was increased from stoichiometric to three times stoichiometric. Comparisons were made with the results from a one-dimensional, finite-rate chemistry code and from one-dimensional cycle codes which assume equilibrium chemistry. These comparisons indicate that the magnitudes and trends of the measured longitudinal pressure distributions are predicted by the one-dimensional codes provided that the relevant physical phenomena are accounted for in the computations.

Author

Hypersonic Combustion; Hypersonic Flow; Gas Mixtures; Test Facilities; Hydrogen Fuels

20080029274 Pratt and Whitney Aircraft, West Palm Beach, FL, USA

Comparisons of a Three-Dimensional, Full Navier Stokes Computer Model with High Mach Number Combuster Test Data

Watkins, William B.; October 29, 1990; 9 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Contract(s)/Grant(s): F33657-86-C-2137

Report No.(s): AIAA Paper-90-5217; Copyright; Avail.: Other Sources

Comparisons between scramjet combustor data and a three-dimensional full Navier-Stokes calculation have been made to verify and substantiate computational fluid dynamics (CFD) codes and application procedures. High Mach number scramjet combustor development will rely heavily on CFD applications to provide wind tunnel-equivalent data of quality sufficient to design, build and fly hypersonic aircraft. Therefore. detailed comparisons between CFD results and test data are imperative. An experimental case is presented, for which combustor wall static pressures were measured and flow-fieid interferograms were obtained. A computer model was done of the experiment, and counterpart parameters are compared with experiment. The experiment involved a subscale combustor designed and fabricated for the National Aero-Space Plane Program, and tested in the Calspan Corporation 96' hypersonic shock tunnel. The combustor inlet ramp was inclined at a 20 angle to the shock tunnel nozzle axis, and resulting combustor entrance flow conditions simulated freestream M=10. The combustor body and cowl walls were instrumented with static pressure transducers, and the combustor lateral walls contained windows through which flowfield holographic interferograms were obtained. The CFD calculation involved a three-dimensional time-averaged full

Navier-Stokes code applied to the axial flow segment containing fuel injection and combustion. The full Navier-Stokes approach allowed for mixed supersonic and subsonic flow, downstream-upstream communication in subsonic flow regions, and effects of adverse pressure gradients. The code included hydrogen-air chemistry in the combustor segment which begins near fuel injection and continues through combustor exhaust. Combustor ramp and inlet segments on the combustor lateral centerline were modelled as two dimensional. Comparisons to be shown include calculated versus measured wall static pressures as functions of axial flow coordinate, and calculated path-averaged density contours versus an holographic Interferogram.
Author
Mach Number; Navier-Stokes Equation; Wind Tunnel Tests; Three Dimensional Flow; Computational Fluid Dynamics; Fabrication; Mathematical Models; Combustion Chambers; Supersonic Combustion Ramjet Engines

20080029275 NASA Langley Research Center, Hampton, VA, USA
An Overview of Selected NASP Aeroelastic Studies at the NASA Langley Research Center
Spain, Charles V.; Soistmann, David L.; Parker, Ellen C.; Gibbons, Michael D.; Gilbert, Michael; October 29, 1990; 17 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-90-5218; Copyright; Avail.: CASI: A03, Hardcopy

Following an initial discussion of the NASP flight environment, the results of recent aeroelastic testing of NASP-type highly swept delta-wing models in Langley's Transonic Dynamics Tunnel (TDT) are summarized. Subsonic and transonic flutter characteristics of a variety of these models are described, and several analytical codes used to predict flutter of these models are evaluated. These codes generally provide good, but conservative predictions of subsonic and transonic flutter. Also, test results are presented on a nonlinear transonic phenomena known as aileron buzz which occurred in the wind tunnel on highly swept delta wings with full-span ailerons. An analytical procedure which assesses the effects of hypersonic heating on aeroelastic instabilities (aerothermoelasticity) is also described. This procedure accurately predicted flutter of a heated aluminum wing on which experimental data exists. Results are presented on the application of this method to calculate the flutter characteristics of a finite-element model of a generic NASP configuration. Finally, it is demonstrated analytically that active controls can be employed to improve the aeroelastic stability and ride quality of a generic NASP vehicle flying at hypersonic speeds.
Author
National Aerospace Plane Program; Transonic Wind Tunnels; General Overviews; Aircraft Models; Aerothermoelasticity; Aerodynamic Configurations; Delta Wings

20080030092 General Applied Science Labs., Inc., Ronkonkoma, NY, USA
Hypervelocity Real Gas Capabilities of GASL's Expansion Tube (HYPULSE) Facility
Tamagno, Jose; Bakos, Robert; Pulsonetti, Maria; Erdos, John; June 18, 1990; 12 pp.; In English; AIAA 16th Aerodynamic Ground Testing Conference, 18-20 Jun. 1990, Seattle, WA, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 90-1390; Copyright; Avail.: CASI: A03, Hardcopy

The expansion tube was developed during the 1960's and 70's as a means of generating j with negligible levels of dissociation of tile test gas or other forms of contamination. It was considered very well-suited to hypersonic real gas studies. However, test time was quite short, typically 300-400 psec, and practical operability appeared limited to a narrow range of test conditions. The last operating expansion tube, a 6' I.D., 120' long facility built by NASA/Langley was decommissioned in 1983, as interest in hypersonics waned. The NASA expansion tube facility has been refurbished and placed back on line by GASL as part of the NASP project. Its real gas capability also makes it well-suited to studies of hypersonic combustion. The present paper presents a resume of CASL's operating experience with the facility, now called HYPULSE, since the first run in March 1989. Although the installation at GASL differs in several details from that at NASA, calibration data taken at the nominal 17,000 fps test condition agree well with the previous NASA data. Methods for varying the test conditions while maintaining acceptable test time and flow quality have been confirmed. Applicability of HYPULSE to hypervelocity combustion studies is demonstrated. Plans for experimental studies of hypervelocity real-gas aeroheating about slender (NASP-type) and blunt (aerobraking-type) bodies, including wall catalyticity effects, are presented. Finally, the potential expansion of the operating conditions and facility performance characteristics that can be achieved by compressive heating of the driver gas using a free piston device are discussed.
Author
Real Gases; Gas Expansion; Pipes (Tubes); Test Facilities; Aerodynamic Heating; National Aerospace Plane Program

20080030206 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Methods of Controlling the Loop Heat Pipe Operating Temperature

Ku, Jentung; June 30, 2008; 10 pp.; In English; SAE International Conference on Environmental Systems, 30 Jun. - 2 Jul. 2008, San Francisco, CA, USA; Original contains black and white illustrations

Report No.(s): Paper 081CES-0270; Copyright; Avail.: Other Sources

The operating temperature of a loop heat pipe (LHP) is governed by the saturation temperature of its compensation chamber (CC); the latter is in turn determined by the balance among the heat leak from the evaporator to the CC, the amount of subcooling carried by the liquid returning to the CC, and the amount of heat exchanged between the CC and ambient. The LHP operating temperature can be controlled at a desired set point by actively controlling the CC temperature. The most common method is to cold bias the CC and use electric heater power to maintain the CC set point temperature. The required electric heater power can be large when the condenser sink is very cold. Several methods have been developed to reduce the control heater power, including coupling block, heat exchanger and separate subcooler, variable conductance heat pipe, by-pass valve with pressure regulator, secondary evaporator, and thermoelectric converter. The paper discusses the operating principles, advantages and disadvantages of each method.

Author

Heat Pipes; Operating Temperature; Conductive Heat Transfer; Thermoelectric Generators; Heat Exchangers

20080030442 Naval Postgraduate School, Monterey, CA USA

Momentum Exchange Near Ice Keels in the Under Ice Ocean Boundary Layer

Bleidorn, John C; Mar 1, 2008; 51 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479823; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479823

This thesis describes momentum exchange in the under-ice ocean boundary layer near ice keels. Understanding ice-ocean momentum exchange is important for accurate predictive ice modeling. Due to climate change, increased naval presence in the Arctic region is anticipated and ice models will become necessary for tactical and safety reasons. Measurements took place in March 2007 in the Beaufort Sea at the Applied Physics Laboratory Ice Station sponsored by the U.S. Navy. Turbulence measurements were made at a single point behind a large multi-year ice ridge in the upper ocean boundary layer. The keel was found to be at least 12.5m deep and much broader than expected. Ocean profiles showed the pycnocline between 13-18m deep and thus a unique situation of measuring the flow around a large ice structure in a shallow boundary layer presented itself. Results indicate that estimates of turbulence intensity depend on ice speed, direction and measurement depth. Velocity spectra indicate periods of low inertial subrange levels likely resulting from close proximity to the pycnocline. Low frequency variance in the velocity spectra was also observed and is thought to be a wake effect resulting from an under ice structure upstream of the flow.

DTIC

Boundary Layers; Ice; Keels; Momentum; Momentum Transfer; Oceans; Shear Stress; Turbulence

20080030605 Naval Postgraduate School, Monterey, CA USA

Ocean Climate Drift and Interdecadal Oscillation Due to a Change in Thermal Damping

Cai, Wenju; Chu, Peter C; Nov 1996; 14 pp.; In English

Report No.(s): AD-A480046; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The authors investigate the effect of a change in the rate of thermal damping upon the climate of an ocean general circulation model. Initially, the thermal forcing condition is that proposed by Haney, that is, restoring the model surface temperature to a climatology. The restoring condition represents a strong damping. When a steady state is reached, the thermal damping is switched to a weaker one, but the atmosphere-ocean heat exchange is adjusted so that at the moment of the switch the heat flux is identical to that prior to the switch. It is found that interdecadal oscillations and climate drift occur as a result of the switch, regardless of the forcing condition for salinity. The cause for the variability and drift can he traced to the spinup. During the spinup, the surface climatology of the model ocean is forcefully ′nudged' toward that of the climatology, regardless of whether or not the internal dynamics of the model ocean can maintain the climatology. This leads to intermittent convections in the spinup State. When the thermal damping becomes weaker, the system chooses a convective pattern (the location and intensity of the convection) more compatible with the internal dynamics. An implication of these results is that drift and variability in a coupled model may be caused by the mechanism. Effects of flux corrections in coupled models are discussed.

DTIC

Climate; Damping; Marine Meteorology; Ocean Models; Oscillations; Thermodynamic Properties

20080030663 Naval Postgraduate School, Monterey, CA USA

A Thermal Oscillation Under a Restorative Forcing

Cai, Wenju; Chu, Peter C; Jun 14, 1997; 18 pp.; In English

Report No.(s): AD-A480337; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The authors report an interceded oscillation in a wind- and thermally-driven ocean general circulation model (OGCM). The oscillation is tantalizing in that it occurs under a relatively strong thermal damping (26.3 W m(exp-2)K(exp-1). Examinations involving a two-dimensional OGCM, a simple thermal flip-flop model and a three-dimensional OGCM with and without the nonlinear effect of temperature in the state equation of sea water demonstrate that the oscillation is not driven by mechanisms such as the so-called convective oscillator, or the advective overshooting oscillator.

DTIC

Damping; Oscillations; Thermodynamic Properties

20080030770 NASA Langley Research Center, Hampton, VA, USA

Boundry Layer Transition in Hypersonic Flows

Malik, M.; Zang, T.; Bushnell, D.; October 29, 1990; 23 pp.; In English; AIAA Second International Aero-Space Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper-90-5232; Copyright; Avail.: CASI: A03, Hardcopy

This paper summarizes some of the recent progress made at NASA Langley Research Center in the understanding, prediction and modeling of high speed boundary-layer transition. Linear and nonlinear theories together with large-eddy and direct numerical simulations have been used to understand various aspects of the transition problem while low disturbance 'quiet' tunnels provide means for validating the theoretical results.

Author

Boundary Layer Transition; Hypersonic Flow; Large Eddy Simulation; Direct Numerical Simulation; Vortices; Computational Fluid Dynamics; National Aerospace Plane Program; Aerospace Planes

20080030821 Air Force Research Lab., Wright-Patterson AFB, OH USA

Temperature Measurements in Reacting Flows Using Time-Resolved Femtosecond Coherent Anti-Stokes Raman Scattering (fs-CARS) Spectroscopy (Postprint)

Roy, Sukesh; Kinnius, Paul J; Lucht, Robert P; Gord, James R; Aug 2007; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-03-D-2329; Proj-3048

Report No.(s): AD-A479621; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479621

Time-resolved femtosecond coherent anti-Stokes Raman scattering (fs-CARS) spectroscopy of the nitrogen molecule is used for the measurement of temperature in atmospheric-pressure, near-adiabatic, hydrogen-air diffusion flames. The initial frequency-spread dephasing rate of the Raman coherence induced by the ultrafast (85 fs) Stokes and pump beams are used as a measure of gas-phase temperature. This initial frequency-spread dephasing rate of the Raman coherence is completely independent of collisions and depends on the frequency spread of the Raman transitions at different temperatures. A simple theoretical model based on the assumption of impulsive excitation of Raman coherence is used to extract temperatures from time-resolved fs-CARS experimental signals. The extracted temperatures from fs-CARS signals are in excellent agreement with the theoretical temperatures calculated from an adiabatic equilibrium calculation. The estimated absolute accuracy and the precision of the measurement technique are found to be 40 K and 50 K, respectively, over the temperature range 1500-2500 K.

DTIC

Coherent Scattering; Navier-Stokes Equation; Raman Spectra; Raman Spectroscopy; Reacting Flow; Spectroscopy; Temperature Measurement

20080030853 Oklahoma State Univ., Stillwater, OK USA

Secondary Breakup of Aerated Liquid Jets in Subsonic Crossflow (Postprint)

Miller, B; Sallam, K A; Bingabr, M; Lin, K; Carter, C; Feb 2008; 14 pp.; In English

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

Report No.(s): AD-A479695; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479695

An experimental investigation of the secondary breakup of an aerated liquid jet in subsonic crossflow is described. The

present test conditions were similar to those encountered in fuel injection in ramjet engines. Previous studies of spray structures of aerated liquid jet in crossflow have been limited to the dilute spray area (downstream distance > 100 jet diameter) using Phase Doppler Particle Analyzer (PDPA) and along the liquid surface using wet-holographic plates. The objective of the present study was to extend these earlier measurements to investigate the dense spray near-injector region immediately downstream of the injector (0-50 jet diameter) where secondary breakup occurs in order to bridge the gap between drop size distribution along the jet surface and those obtained using PDPA in the far-field of the injector. Three-dimensional microscopic digital holography was used to record and measure droplets sizes and locations within the three-dimensional volume of the spray. The test conditions include different gas-to-liquid mass flow rate ratios and jet-to-free stream momentum flux ratios. DTIC

Aeration; Cross Flow; Fluid Jets; Subsonic Flow

20080030854 Taitech, Inc., Beavercreek, OH USA

Flame Characteristics and Fuel Entrainment Inside a Cavity Flame Holder in a Scramjet Combustor (Postprint)

Lin, Kuo-Chen; Tam, Chung-Jen; Boxx, Isaac; Carter, Campbell; Jackson, Kevin; Lindsey, Martin; Jul 2007; 21 pp.; In English

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

Report No.(s): AD-A479694; AFRL-RZ-WP-TP-2008-2039; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479694

Flame structures and operating limits of an ethylene-fueled recessed cavity flameholder were investigated both experimentally and numerically, using a newly developed AFRL research scram jet flowpath at Wright-Patterson Air Force Base. Flush-wall low-angled injectors were used as main fuel injectors. The recessed cavity features an array of fueling ports on the aft ramp for direct cavity fueling. The cavity operating conditions include 1) direct cavity fueling, 2) direct cavity fueling with back pressurization, and 3) fueling from main injectors with and without direct cavity fueling. With direct cavity fueling, significant variation in the shape and spatial distribution of the cavity flame was observed at various fuel flow rates with and without back pressurization. It was found that both lean ignition and blowout limits increase with the characteristic air flow rate. The lean blowout limit is decreased toward a lower value as the shock train is pushed toward upstream. With fueling from main injectors, the flame is mainly distributed within the body wall comers for the present flowpath. DTIC

Cavities; Combustion Chambers; Entrainment; Ethylene; Flame Holders; Flames; Supersonic Combustion Ramjet Engines; Supersonic Flow

20080030939 NASA Langley Research Center, Hampton, VA, USA

NASP Aerodynamics

Whitehead, Allen H, Jr.; July 20, 1989; 13 pp.; In English; AIAA First National Aero-Space Plane Conference, 20-21 Jul. 1989, Dayton, OH, USA; Original contains black and white illustrations

Report No.(s): AIAA Paper 89-5013; Copyright; Avail.: CASI: A03, Hardcopy

This paper will discuss the critical aerodynamic technologies needed to support the development of a class of aircraft represented by the National Aero-Space Plane (NASP). The air-breathing, single-stage-to-orbit mission presents a severe challenge to all of the aeronautical disciplines and demands an extension of the state-of-the-art in each technology area. While the largest risk areas are probably advanced materials and the development of the scramjet engine, there remains a host of design issues and technology problems in aerodynamics, aerothermodynamics, and propulsion integration. The paper presents an overview of the most significant propulsion integration problems, and defines the most critical fluid flow phenomena that must be evaluated, defined and predicted for the class of aircraft represented by the Aero-Space Plane. Author

Aerodynamics; Aerothermodynamics; National Aerospace Plane Program; Supersonic Combustion Ramjet Engines; Computational Fluid Dynamics

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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*.

20080030213 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Improved Formulation for Calorimetric Emittance Testing of Spacecraft Thermal Control Coatings

Kauder, Lonny R.; May 19, 2008; 7 pp.; In English; Protection of Materials and Structures From Space Environment, 19-23 May 2008, Toronto, Canada; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030213

Spacecraft often really heavily on passive thermal control to maintain operating temperature. An important parameter in the spacecraft heat balance equation is the emittance of thermal control coatings as a function of coating temperature. One method for determining the emittance of spacecraft thermal control from elevated temperature to cryogenic temperatures relies on a calorimetric technique. The fundamental equation governing this test method can be found in numerous places in the literature and although it generally provides reasonable results, its formulation is based on a conceptual flaw that only becomes apparent when the sample temperature approaches the wall temperature during testing. This paper investigates the cause for this error and develops the correct formulation for calorimetric emittance testing. Experimental data will also be presented that illustrates the difference between the two formulations and the resulting difference in the calculated emittance.
Author

Calorimeters; Emittance; Temperature Control; Heat Balance; Spacecraft; Thermal Control Coatings

20080030265 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The Space Infrared Interferometric Telescope (SPIRIT): The Mission Design Solution Space and the Art of the Possible

Leisawitz, David; Hyde, T. Tupper; Rinehart, Stephen A.; Weiss, Michael; June 22, 2008; 11 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030265

Although the Space Infrared Interferometric Telescope (SPIRIT) was studied as a candidate NASA Origins Probe mission, the real world presents a broader set of options, pressures, and constraints. Fundamentally, SPIRIT is a far-IR observatory for high-resolution imaging and spectroscopy designed to address a variety of compelling scientific questions. How do planetary systems form from protostellar disks, dousing some planets in water while leaving others dry? Where do planets form, and why are some ice giants while others are rocky? How did high-redshift galaxies form and merge to form the present-day population of galaxies? This paper takes a pragmatic look at the mission design solution space for SPIRIT, presents Probe-class and facility-class mission scenarios, and describes optional design changes. The costs and benefits of various mission design alternatives are roughly evaluated, giving a basis for further study and to serve as guidance to policy makers.
Author

Imaging Techniques; Infrared Telescopes; Interferometry; Spaceborne Telescopes; Mission Planning

20080030275 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Tools for Observing our Universe

Wollack, Ed; January 10, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

A selection of hands on demonstrations related to the detection of light will be presented to middle students. The primary emphasis of the talk will be on conveying how scientists use light to remotely observe and understand the properties of astrophysical systems.
Author

Optics; Remote Sensing; Light (Visible Radiation); Laboratory Astrophysics

20080030378 Naval Submarine Medical Research Lab., Groton, CT USA

Location of Triage of Disabled Submarine (DISSUB) Survivors: Validating Equipment and Procedures

Gertner, Jeffrey; Duplessis, Christopher; Horn, Wayne; Mar 14, 2008; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479607; NSMRL/50514/TR--2008-1259; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479607

This report describes findings on an assortment of technologies focused on the location and triage of disabled submarine

(DISSUB) survivors. In a DISSUB scenario, survivors are exposed to numerous threats such as hyper-/hypothermia, buildup of toxic gases, increased carbon dioxide levels, and/or decreased levels of oxygen. These could easily render any survivors unresponsive and hinder efficient, focused triage and rescue efforts. Further confounding rescue efforts, first responders may have varying levels of medical experience and are seeking to locate and triage casualties in the dark, confined environment of a DISSUB. Additionally, both responders and casualties may be wearing protective overgarments with toxic gases or flooding in the associated spaces. Thus, there is a need for development and implementation of equipment to assist first responders in the rapid identification and triage of any survivors. Three specific areas of technology were investigated in this initial assessment: biosensor monitoring, expedited location of casualties, and rapid life/death determination. Overall, 10 pieces of equipment were tested and only one was recommended for use in its current state. This was the Naval Firefighter Thermal Imager (NFTI) that is already in place onboard submarines. While several other technologies demonstrated great potential for future benefit, in their current state they were either prohibitively costly or their function was performed better using simpler and more reliable techniques such as confirming a palpable carotid pulse.
DTIC
Biological Effects; Detection; Disabilities; Position (Location); Submarines

20080030383 Army Tank-Automotive and Armaments Command, Warren, MI USA
Simulation and Comparison of Infra-red Sensors for Automotive Applications
Meitzler, Thomas J; Sohn, Euijung; Karlsen, Robert E; Gerhart, Grant R; Lakshmanan, Sridhar; Apr 19, 1995; 10 pp.; In English
Report No.(s): AD-A479631; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479631

This paper presents a simulation and comparison of two different infrared (IR) imaging systems in terms of their use in automotive collision avoidance and vision enhancement applications. The first half of this study concerns the simulations of a 'cooled' shortwave focal plane array infrared imaging system, arid an 'uncooled' focal plane array infrared imaging system. That is done using the USA Army's Tank-Automotive Research Development and Engineering Center's (TARDEC) Thermal Image Model - (TTlM). Visual images of automobiles as seen through a forward looking infrared sensor are generated, by using TrIM, under a variety of viewing range, and rain conditions. The second half of the study focuses on a comparison between the two simulated sensors. This comparison is undertaken from the standpoint of the ability of a human observer to detect potential (collision) targets, when looking through the two different sensors A measure of the target's detectability is derived for each sensor by using the TARDEC's Visual Model (TVM). The authors found the uncooled pyroelectric FPA to give excellent imagery and, combined with the advantages of the 7.5-13.5 band in the atmosphere and the higher blackbody existance in the 7.5-13.5 band, the 7.5-13.5 uncooled sensor is therefore the better choice for imaging through numerous atmospheric conditions compared to the 3.4-5.5 cooled sensor.
DTIC
Automobiles; Infrared Detectors; Simulation

20080030400 Army Research Lab., Adelphi, MD USA
UGS, UGV, and MAV in the 2007 C4ISR OTM Experiment
Gregory, Timothy G; Kovach, Jesse B; Winkler, Robert P; Winslow, Christopher H; Apr 2008; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479703; ARL-TR-4419; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479703

In the summer of 2007 as part of the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance On-the-Move (C4ISR OTM) experiment, the Army Research Laboratory (ARL) and the Communications-Electronics Research, Development, and Engineering Command (CERDEC) demonstrated the viability of integrating a variety of unattended ground sensors (UGS), unmanned ground vehicles (UGVs), and micro air vehicles (MAVs) into a Force XXI Battle Command Brigade and Below (FBCB2) based system that provides situational awareness (SA) and command and control (C2) to the lowest tactical echelons. In this report we describe the system architecture, techniques and components used to effect this integration.
DTIC
Architecture (Computers); Command and Control

20080030468 Denver Univ., Denver, CO USA

Developing an Efficient and Cost Effective Ground-Penetrating Radar Field Methodology for Subsurface Exploration and Mapping of Cultural Resources on Public Lands

Conyers, Lawrence B; Jul 28, 2006; 127 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-SI-1261

Report No.(s): AD-A479867; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479867

In archeological surveys of artifacts hidden under the ground, there are a number of issues that must be faced in determining where to excavate and still only minimally disturb the artifacts. Some of these artifacts have spiritual significance while others are of general historical nature. In using noninvasive means to determine the presence of these artifacts, a number of options are available. A new, emerging technology is the use of ground penetrating radar (GPR). However, in using this device due to the number of variables that can impact energy penetration and resolution, researchers are often not guaranteed a successful survey. Simple factors such as soil mineralogy or moisture content can often generate sometimes confusing and difficult to. The purpose of this project was to address such consistency problems with GPR surveys. To do this, the project sought to identify specific factors that will either benefit or complicate a GPR survey. Along with isolating the impacts of these factors, the project sought to develop a series of procedures to predict ahead of time what tools will be needed for a survey, and if that survey has a chance of success. In general, the questions this study sought to answer included: * Which variables are most affecting energy transmission and reflection? * Which are most affecting data resolution? Depth of penetration? * What parameters (geological, climatic, etc.) are most crucial to GPR surveys.

DTIC

Cost Effectiveness; Cultural Resources; Ground Penetrating Radar; Land Use; Thematic Mapping

20080030564 Naval Postgraduate School, Monterey, CA USA

Reliability of Iris Scanning as a Means of Identity Verification and Future Impact on Transportation Worker Identification Credential

McLaren, Simon; Mar 2008; 147 pp.; In English

Report No.(s): AD-A479955; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Homeland Security is deploying the Transportation Worker Identification Credential (TWIC) to U.S. ports to help ensure only authorized individuals having undergone background checks have access to secure areas. Congress mandated the TWIC have a biometric authenticator; DHS chose fingerprints. This thesis argues iris scanning is a better choice because of the nature of the maritime environment and because iris scanning is a more accurate biometric. This thesis also argues there are social factors affecting a biometric enabled identification card which must be considered for the program to be successful. To investigate the issue of biometrics and the TWIC, this thesis performed a field study of an iris scanner; a survey of biometric attitudes, and interviews with members of the PMA and the ILWU. The iris study operated the scanner in an identification mode, experiencing no false acceptances and few false rejects; however it found the scanner sensitive to sun position with respect to the subject. The pilot study of attitudes found subjects supportive of biometrics in scenarios currently requiring positive identification, but opposing them when it would create new requirements for identification. Both pilot studies were impacted by an inability to provide an incentive to study subjects.

DTIC

Biometrics; Identities; Reliability; Security; Transportation

20080030654 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA

Detection Thresholds for Tracking in Clutter - A Connection Between Estimation and Signal Processing

Fortmann, Thomas E; Bar-Shalom, Yaakov; Scheffe, Molly; Gelfand, Saul; Dec 7, 1983; 67 pp.; In English

Report No.(s): AD-A480220; 5495; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Tracking performance depends upon the quality of the measurement data. In the Kalman-Bucy filter and other trackers, this dependence is well-understood in terms of the measurement noise covariance matrix, which specifies the uncertainty in the values of the measurement inputs. The measurement noise and process noise covariances determine via the Riccati equation, the state estimation error covariance. When the origin of the measurements is also uncertain, one has the widely-studied problem of data association (or data correlation), and tracking performance depends critically on additional parameters, primarily the probabilities of detection and false alarm. In this paper we derive a modified Riccati equation that quantifies (approximately) the dependence of the state error covariance on these parameters. We also show how to use a ROC

curve in conjunction with the above relationship to determine an optimal detection threshold in the signal processing system that provides measurements to the tracker. A validation of the modified Riccati equation is also presented.
DTIC
Clutter; Detection; Signal Processing

20080030876 Army Research Lab., Adelphi, MD USA
AMR Magnetometer Data on Moving Military Vehicles at Aberdeen Proving Ground
Fine, Jonathan E; Edelstein, Alan S; Hull, David M; Sep 2007; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480209; ARL-TR-4267; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have collected magnetic signature data on three vehicles of military interest at Aberdeen Proving Ground, MD, in September 1999 using low cost, commercial anisotropic magnetoresistance sensors. Vehicles were driven passed sensors that were located at 12 ft and 36 ft from the center of the track. The magnetic signatures that were obtained were different for the three different vehicles investigated, although some details of the signal were lost at the larger distance. The total field from the tank varied as 1/r(exp 3) where r is the distance between the sensor and the vehicle. The different magnetic signals generated from a tank moving backward and forward, rotating the tank's turret, and raising and lowering the tank's gun were clearly distinguishable. The signals from the tank had nearly the same values at the 12 ft and 36 ft distances, when their values were normalized by the peak values, and time axis was normalized by time interval between half-maximum amplitude points.
DTIC
Magnetic Fields; Magnetic Signatures; Microinstrumentation; Sensors; Targets

20080030941 NASA Lewis Research Center, Cleveland, OH, USA
PdCr Based High Temperature Static Strain Gage
Lei, Jih-Fen; Williams, W. D; October 29, 1990; 8 pp.; In English; AIAA Second International Aerospace Planes Conference, 29-31 Oct. 1990, Orlando, FL, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper-90-5236; Copyright; Avail.: Other Sources

The program at NASA Lewis Research Center to develop a high temperature static strain gage system for the hypersonic vehicle and turbine engine research has emphasized a palladium- 13wt%chromium (PdCr) alloy. Gages made from this alloy are being developed in both fine wire and thin film form. The wire gage system had platinum wire as a temperature compensator and was coated with a special alumina and zirconia mixture overcoat. This PdCr compensated wire gage responded linearly to the imposed strain to at least i000 microstrain. The strain sensitivity of the gage did not vary much with temperature. The apparent strain of this compensated gage was significantly lower than that of the other gages. It varied within 300 microstrain from room temperature to 800 deg. C with a reproducibility within 50 microstrain between thermal cycles to 800 deg. C. This is a significant advance over the 400 deg. C barrier of previous techniques for resistance static strain gages. The sputtered thin film PdCr strain gage, whose size was 8x8 mm and 10 micron thick, has demonstrated the possibility of extending the use of the PdCr strain gage to a temperature of approximately 1000 deg. C.
Author
High Temperature; Palladium Alloys; Strain Gages; Thin Films; Wire; Chromium Alloys

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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*.

20080030565 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Quantitative UV Absorbance Spectra of Chemical Agents and Simulants
Lochner, J M; Hyre, Aaron M; Christesen, Steven D; Gonser, Kristina R; Mar 2008; 41 pp.; In English
Report No.(s): AD-A479956; ECBC-TR-611; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The quantitative UV absorption spectra of selected chemical agents and simulants have been measured for wavelengths in the near UV from 200 to 400 nm. Although these data are of interest in their own right, they are also necessary for predicting the sensitivity of UV Raman based detection systems. Of particular interest are the absorption values at 248.25 nm and 262 nm as these correspond to excitation wavelengths used by UV Raman based surface contamination detectors currently under

development. These wavelengths are produced by KrF excimer lasers and quadrupled Nd:YLF lasers, respectively. This report collates these data in a presentable form.
DTIC
Absorptivity; Detectors; Lasers; Raman Spectra; Ultraviolet Spectra

20080030604 Naval Postgraduate School, Monterey, CA USA
Free Electron Laser Analysis For the Innovative Navy Prototype
Smith, Darin S; Mar 2008; 81 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Free Electron Lasers are the focus of a recently announce Innovative Navy Prototype to develop a directed energy weapon system for the self-defense of ships. Operating in a shipboard environment poses several challenges that must be overcome. Short Rayleigh length systems offer solutions to some of these problems. Simulations were performed to examine the benefit of short Rayleigh length designs in the face of electron beam misalignment. Additionally, simulations were performed to explore the effect of quadrupole misalignment on electron beam position and trajectory, and ultimately on FEL performance.
DTIC
Free Electron Lasers; Navy; Prototypes

20080030860 Air Force Research Lab., Wright-Patterson AFB, OH USA
Sub-Nanosecond Infrared Optical Parametric Pulse Generation in Periodically Poled Lithium Niobate Pumped by a Seeded Fiber Amplifier
Cocuzzi, Matthew D; Feb 2008; 92 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2003
Report No.(s): AD-A480009; AFRL-RY-WP-TR-2008-1033; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A ytterbium-doped, polarization maintaining PM double-clad fiber was seeded at one end and pumped at the other end, using dichroic filters to protect the pump and seed lasers, creating a fiber amplifier. The seed laser was a passively Q-switched Nd:YAG microchip laser operating at 1064 nm, polarized 99:1, 7.14 kHz repetition rare, 0.5 nsec pulse width, average power of 38 mW, and 5.3 microjoule pulse energy. The pump laser was a 915 nm diode laser coupled to a fiber pigtail, operating at a maximum of 6 W with 7 A of operating current. The 3.56-m-long FC connectorized fiber was the active element and had a 25 micron core diameter and a 248 micron inner cladding diameter with 400- micron-diameter spliced silica end-caps to prevent damage polished at 8 to prevent back reflections. The PPLN crystal was an uncoated 1 x 14 x 49-mm-long multigrating crystal with approximate parallelism of the front and back surfaces. The domain grating period used was 29.5 micron, converting the 720 mW (over 100 microjoule pulse energy) fiber amplifier beam to a 1.507 micron signal beam and a 3.619 m idler beam, with 24% of the pump energy going to the signal and idler outputs.
DTIC
Infrared Radiation; Lithium Niobates; Pulse Generators; Semiconductor Lasers

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20080029317 Caterpillar, Inc., Peoria, IL, USA
Silver Doped Catalysts for Treatment of Exhaust
Park, P. W., Inventor; Boyer, C. L., Inventor; 24 Jun 04; 11 pp.; In English
Contract(s)/Grant(s): DE-AC0500OR22725
Patent Info.: Filed Filed 24 Jun 04; US-Patent-Appl-SN-10-874-209
Report No.(s): PB2007-110077; No Copyright; Avail.: CASI: A03, Hardcopy

A method of making an exhaust treatment catalyst includes dispersing a metal-based material in a first solvent to form a first slurry and allowing polymerization of the first slurry to occur. Polymerization of the first slurry may be quenched and the first slurry may be allowed to harden into a solid. This solid may be redistributed in a second solvent to form a second

slurry. The second slurry may be loaded with a silver-based material, and a silver-loaded powder may be formed from the second slurry.
NTIS
Catalysts; Doped Crystals; Patent Applications; Silver

20080029394 NASA Johnson Space Center, Houston, TX, USA
Effects of Laser and Shot Peening on Fatigue Crack Growth in Friction Stir Welds
Hatamleh, Omar; Forman, Royce; Lyons, Jed; May 14, 2006; 10 pp.; In English; 2006 International Fatigue Congress, 14-16 May 2006, Atlanta, GA, USA; Copyright; Avail.: CASI: A02, Hardcopy

The effects of laser, and shot peening on the fatigue life of Friction Stir Welds (FSW) have been investigated. The surface roughness resulting from various peening techniques was assessed, and the fracture surfaces microstructure was characterized. Laser peening resulted in an increase in fatigue life approximately 60%, while shot peening resulted in 10% increase when compared to the unpeened material. The surface roughness of shot peening was significantly higher compared to the base material, while specimens processed with laser peening were relatively smooth.
Author
Shot Peening; Lasers; Surface Cracks; Crack Propagation; Fatigue Life; Friction Stir Welding; Metals

20080030272 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Coating Performance and Thermal Structure Design for Heat Reflectors of JWST Electronic Control Unit
Quijada, Manuel A.; Threat, Felix; Garrison, Matt; Perrygo, Chuck; Bousquet, Robert; Rashford, Robert; June 23, 2008; 1 pp.; In English; SPIE Astronomical Instrumentation 2008 Conference, 23-28 Jun. 2008, Karseilles, France; No Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) consists of an infrared-optimized Optical Telescope Element (OTE) that is cooled down to 40 degrees Kelvin. A second adjacent component to the OTE is the Integrated Science Instrument Module, or ISIM. This module includes the electronic compartment, which provides the mounting surfaces and ambient thermally controlled environment for the instrument control electronics. Dissipating the 200 watts generated from the ISIM structure away from the OTE is of paramount importance so that the spacecraft's own heat does not interfere with the infrared light detected from distant cosmic sources. This technical challenge is overcome by a thermal subsystem unit that provides passive cooling to the ISIM control electronics. The proposed design of this thermal radiator consists of a lightweight structure made out of composite materials and low-emittance metal coatings. In this paper, we will present characterizations of the coating emittance, bidirectional reflectance, and mechanical structure design that will affect the performance of this passive cooling system.
Author
James Webb Space Telescope; Control Units (Computers); Heat Radiators; Optical Materials; Coatings

20080030377 Army Research Lab., Adelphi, MD USA
XM982 Palladin Hold Down Strap Characterization
Berman, Morris; Gray, David; Mar 2008; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479593; ARL-MR-0675; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479593

As the XM982 projectile transitions to its production phase, several questions were raised regarding the rounds' response to tactical vibration in the Paladin vehicle. The U.S. Army Research Laboratory carried out an extensive program to characterize the straps used to retain the projectiles in the Paladin vehicle. The characterization tests included stiffness, short-term and long-term creep. A definite relationship is shown between a strap's load carrying ability and time under stress as well as number of stress cycles.
DTIC
Characterization; Projectiles; Straps; Vibration

20080030562 Department of the Navy, Washington, DC USA
Flange Penetrator Pressure Test Fixture. Statement of Government Interest
Phelps, Peter T, Inventor; Sep 22, 2006; 19 pp.; In English
Report No.(s): AD-D020359; No Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/100.2/ADD020359

An apparatus as a fixture for fluidly pressure testing a flange penetrator seal with the apparatus having a flange cover

including a recess and a flange extension including a recess with the extension matable to the cover such that the recesses create a volume around the seal. The extension is secured to the flange of a device for which the flange penetrator seal supports. The cover has a pressure fitting for application of fluid pressure to the recess of the cover for pressure testing the seal within the volume and the extension having a fitting for draining the volume after testing is complete. The test fixture includes a clamping fixture attachable to the cover, the clamping fixture encompassing the flange cover and the extension such that the apparatus can be further secured to the flange of the device which the flange penetrator seal supports.
DTIC
Fixtures; Flanges; Penetration; Pressure

20080030890 Allied-Signal Aerospace Co., Los Angeles, CA, USA
Foil Bearing Liquid Hydrogen Turbopump Technology Demonstrator Program
August 17, 1988; 34 pp.; In English; Original contains black and white illustrations
Report No.(s): 88-61706; CN-164-552; No Copyright; Avail.: Other Sources

This report for a technology demonstration program shows the advantages in unit life and reliability of process fluid foil bearings for liquid hydrogen turbopumps. These fluid foil bearings have been successfully used in high-speed aircraft air cycle cooling turbines and other turbomachines, such as gas turbines, helium compressors, etc. Foil bearings have also been used in increasing numbers of cryogenic turbomachines in which ordinary lubrication systems have generally ceased to function properly. The distinct advantages of using foil bearings in cryogenic liquid hydrogen turbopumps to improve their lives and reliability has been recognized. Efforts were previously initiated to study the bearings in the cryogenic turbopump operating environment. Through combined analytical and experimental efforts, a record 250 psi specific bearing load capacity was achieved in a simulated liquid hydrogen environment. An attempt was made to design a liquid hydrogen turbopump with a 10 lb/sec flow rate and 5500 psia outlet pressure, typical for the national aerospace (NASP) application, incorporating process fluid foil bearings. Preliminary design analysis indicates that the foil bearings have adequate load capacity, and that this foil bearing turbopump is free from any critical speeds in the operating speed range. The analysis also shows that the foil bearing liquid hydrogen turbopump has a similar fluid mechanical performance and appears more rigid and compact than ball bearing units. Due to these encouraging results a foil bearing liquid hydrogen turbopump technology program is proposed to demonstrate the reliability and long life features of foil bearing turbopumps. The program consists of three tasks: foil bearing turbopump design, foil bearing design and evaluation, and turbopump demonstration. A general discussion of liquid hydrogen turbopumps and foil bearing advantages, as well as the design of the 10 lb/sec and 5500 psia foil bearing liquid hydrogen turbopump, are presented. The proposed program and the detailed program plan are provided and the the related foil bearing research and development progress, experience, and capabilities are summarized.
Derived from text
Foil Bearings; Liquid Hydrogen; Turbine Pumps; Technology Assessment; National Aerospace Plane Program; Mechanical Engineering

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*.

20080029342 University of Central Florida, Orlando, FL, USA
Integrative Information System Design for Florida Department of Transportation: A Framework for Structural Health Monitoring of Movable Bridges
Catbas, F. N.; Susoy, M.; Zaurin, R.; Gul, M.; Jun. 2007; 229 pp.; In English
Report No.(s): PB2007-112670; No Copyright; Avail.: National Technical Information Service (NTIS)

Bridges constitute critical nodes of transportation systems, and therefore, ensuring their continuous operation is of utmost importance for safe and efficient transportation. Currently, visual inspections and simplified analysis techniques are employed for condition assessment and for decision making about bridges. A novel approach to bridge condition assessment is Structural Health Monitoring (SHM), defined as the measurement of operating and loading environment and critical responses of a system to track and evaluate incidents, anomalies, damage and deterioration. The objective of the project is to develop an SHM framework for integrative information system design. This framework is expected to improve bridge safety and to have efficient operation, effective and low cost maintenance by taking advantage of new technological advances. Movable bridges

are considered as focus bridge type, because these bridges exhibit various structural, maintenance and operational problems. In the study, inspection and maintenance records of the movable bridges are analyzed to determine the current condition of these bridges as given in these reports. Then, numerical and experimental studies are developed and conducted. Data processing and some novel analysis methods that are being employed by the writers are summarized along with examples from laboratory studies.
NTIS
Information Systems; Systems Engineering; Bridges; Structural Stability

20080030104 Analytical Services and Materials, Inc., Hampton, VA, USA
Evaluation of Advanced Composite Structures Technologies for Application to NASA's Vision for Space Exploration
Tenney, Darrel R.; July 2008; 210 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNL04AA10B; WBS 441261.04.23.04.04
Report No.(s): NASA/CR-2008-215122; NNL07AD55T; No Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030104

AS&M performed a broad assessment survey and study to establish the potential composite materials and structures applications and benefits to the Constellation Program Elements. Trade studies were performed on selected elements to determine the potential weight or performance payoff from use of composites. Weight predictions were made for liquid hydrogen and oxygen tanks, interstage cylindrical shell, lunar surface access module, ascent module liquid methane tank, and lunar surface manipulator. A key part of this study was the evaluation of 88 different composite technologies to establish their criticality to applications for the Constellation Program. The overall outcome of this study shows that composites are viable structural materials which offer from 20% to 40% weight savings for many of the structural components that make up the Major Elements of the Constellation Program. NASA investment in advancing composite technologies for space structural applications is an investment in America's Space Exploration Program.
Author
Composite Materials; Cylindrical Shells; Structural Design; Composite Structures; Surveys

20080030430 Applied Research Associates, Inc., Tyndall AFB, FL USA
Resistance of Membrane Retrofit Concrete Masonry Walls to Lateral Pressure (POSTPRINT)
Moradi, Lee G; Davidson, James S; Dinan, Robert J; Apr 2008; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F08637-03-C-6006; Proj-4918
Report No.(s): AD-A479799; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479799

This paper first describes the current state of analysis for the response of unreinforced concrete masonry walls subjected to lateral uniform pressure. The formulation is based on the initial elastic response, the subsequent initiation of cracks and the nonlinear rocking response, and the eventual large displacement and wall's potential collapse. The necessary equations are developed for these phases in the form of a resistance function. The paper then incorporates membrane retrofit materials to strengthen the wall's resistance to lateral pressure, and develops the necessary resistance function equations. In blast tests, membrane retrofit unreinforced masonry walls have experienced severe cracking and large displacements without collapse. This is of high interest to the areas of DOD Force Protection, the Department of Homeland Security, and the construction industry impacted by hurricanes and other high wind events. The paper concludes with several illustrations and examples that the application of membrane retrofits indeed increases the resistance of the wall to lateral pressure.
DTIC
Concretes; Masonry; Membranes; Retrofitting; Shelters; Walls

20080030631 Library of Congress, Washington, DC USA
Afghanistan's Path to Reconstruction: Obstacles, Challenges, and Issues for Congress
Margesson, Rhoda; Sep 20, 2002; 24 pp.; In English
Report No.(s): AD-A480143; CRS-RL31355; No Copyright; Avail.: Defense Technical Information Center (DTIC)

For the past 22 years, Afghanistan has been embroiled in conflict. Humanitarian assistance programs have been a key part of the overall multilateral effort to relieve human suffering and assist refugees and internally displaced persons (IDPs). Since September 11, 2001, while actions are still being taken to eliminate Taliban and Al Qaeda forces and others supporting terrorism, the needs have only become more urgent. The case of Afghanistan may present a special category of crisis, in which the USA and others play a significant role in the war on terrorism while simultaneously providing humanitarian and

reconstruction assistance to the innocent civilians caught in the crossfire. Moreover, the conditions in Afghanistan represent a challenging mix of infrastructure destruction, ongoing security concerns, and humanitarian needs requiring an immediate response. So far, the international community has recognized that large amounts of aid and resources will be required in the reconstruction effort. In addition, a long-term commitment will be necessary to ensure a stable, democratic Afghanistan emerges and will not fall prey to the twin evils of drugs and terrorism. While continuing to hunt down Al Qaeda forces within Afghanistan, transitional and reconstruction assistance has also moved ahead. An examination of the progress of reconstruction efforts and aid priorities in the last year reveals the complexity of the tasks ahead and raises questions about the long-term role to be played by the USA. Congress may continue to look at the contributions by and responsibilities of key allies partnering in the efforts within Afghanistan. The current operating environment demonstrates ongoing challenges for the government and people of Afghanistan. Of potential immediate interest to Congress are security concerns, support of the transitional administration, oversight and coordination of aid projects, and the plight of women and children.
DTIC
Afghanistan; Security; Stability

20080030651 General Accounting Office, Washington, DC USA
Defense Infrastructure: Continued Management Attention Is Needed to Support Installation Facilities and Operations
Lepore, Brian J; Little, Mark; Anderson, Bonita; Knobler, Harry; Lacasse, Mary Jo; Margraf, Josh; Phillips, Gary; Apr 2008; 70 pp.; In English
Report No.(s): AD-A480210; GAO-08-502; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) manages and operates about 577,000 structures worldwide, valued at about $712 billion. DoD has worked for several years to develop models that can reliably estimate the installation support funds needed to sustain these facilities, and plans to spend over $55 billion to support these facilities and operate its bases in fiscal year 2008. Because GAO has identified support infrastructure as a high-risk area that affects DoD's ability to devote funds to other more critical needs, GAO initiated this review under the Comptroller General's authority. This report discusses the following: (1) the reliability of the annual funding estimates produced by the facilities sustainment model, (2) DoD's progress in meeting funding goals for facility sustainment and recapitalization, (3) the extent to which DoD has addressed deferred facility sustainment funding needs, and (4) the status of DoD's efforts to develop a new installation services model. To address these objectives, GAO reviewed the accuracy and support for the model's key inputs, analyzed pertinent documents, and visited eight selected installations. GAO recommends that DoD take several actions to increase the facilities sustainment model's reliability, address deferred facility sustainment funding requirements, and advance progress in implementing the installation services model. DoD generally agreed with the recommendations.
DTIC
Buildings; Cost Analysis; Cost Estimates; Defense Program; Installing; Maintenance

20080030820 Air Force Research Lab., Wright-Patterson AFB, OH USA
Aerodynamic Performance of an Injector Strut for a Round Scramjet Combustor (Postprint)
Tam, Chung-Jen; Hsu, Kuang-Yu; Gruber, Mark R; Raffoul, Charbel N; Jul 2007; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-03-D-2419; Proj-3012
Report No.(s): AD-A479623; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479623

Numerical studies were performed to examine different strut configurations to determine their mixing characteristics for possibly use with fuel-injector ports for round scram jet-combustor applications. Several strut configurations were tested to provide a better understanding of the flow physics, in terms of pressure, total pressure recovery, vorticity magnitude, streamlines, and velocity vectors. The conceptual strut designs were placed in a rectangular flow path, and the computations will be followed by an experimental program in the AFRL/RZA Research Cell 19 supersonic wind-tunnel facility, which has a rectangular cross-section area of 12.7 cm x 15.24 cm. The struts were sized, however, for eventual use in a 25.4 cm (10-inch) round combustor. The strut with a constant leading-edge angle and a moderately swept trailing edge seems to provide reasonably good mixing flow features without significantly compromising the total pressure recovery.
DTIC
Aerodynamic Characteristics; Combustion Chambers; Injectors; Jet Engines; Struts; Supersonic Combustion Ramjet Engines

20080030851 Applied Research Associates, Inc., Tyndall AFB, FL USA
Ductile Thin Sheets for Blast Retrofit PREPRINT
Salim, Hani A; Dinan, Robert J; Hoemann, John; Dinan, Robert J; Mar 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915
Report No.(s): AD-A479754; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479754

Blast resistant design has come to the forefront of engineering concerns in the wake of recent terrorist threats to the USA. Safety and security are of utmost concern when designing structures, and there has been a significant rise in the demand for researching new methods of reinforcing and retrofitting structures to provide better resistance to blast loadings. The focus of this paper is on the use of thin sheets as a method of such retrofits. Research is done to ascertain the sheets strength, analyze the response of the sheets to the application of static pressure, explore strength and ductility limits, investigate connection details, and develop an analytical model for defining the materials static resistance function, which will be verified by experimental data. The analytical model for the resistance function will be used in a single-degree of freedom (SDOF) dynamic model to predict the response of the sheathings in a blast-retrofitted wall system.
DTIC
Ductility; Retrofitting; Shelters

20080030948 NASA Langley Research Center, Hampton, VA, USA; Northrop Grumman Corp., El Segundo, CA, USA
Evaluation of Composite Structures Technologies for Application to NASA's Vision for Space Exploration (CoSTS)
Deo, Ravi; Wang, Donny; Bohlen, Jim; Fukuda, Cliff; July 2008; 56 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL04AA13B; WBS 441261.04.23.04.04
Report No.(s): NASA/CR-2008-215333; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030948

A trade study was conducted to determine the suitability of composite structures for weight and life cycle cost savings in primary and secondary structural systems for crew exploration vehicles, crew and cargo launch vehicles, landers, rovers, and habitats. The results of the trade study were used to identify and rank order composite material technologies that can have a near-term impact on a broad range of exploration mission applications. This report recommends technologies that should be developed to enable usage of composites on Vision for Space Exploration vehicles towards mass and life-cycle cost savings.
Author
Composite Materials; Composite Structures; Cost Reduction; Life Cycle Costs; Habitats

20080030949 Boeing Phantom Works, Huntington Beach, CA, USA
Evaluation of Advanced Composite Structures Technologies for Application to NASA's Vision for Space Exploration
Messinger, Ross; July 2008; 144 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL04AA11B; WBS 441261.04.23.04.04
Report No.(s): NASA/CR-2008-215120; No Copyright; Avail.: CASI: A07, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030949

An assessment was performed to identify the applicability of composite material technologies to major structural elements of the NASA Constellation program. A qualitative technology assessment methodology was developed to document the relative benefit of 24 structural systems with respect to 33 major structural elements of Ares I, Orion, Ares V, and Altair. Technology maturity assessments and development plans were obtained from more than 30 Boeing subject matter experts for more than 100 technologies. These assessment results and technology plans were combined to generate a four-level hierarchy of recommendations. An overarching strategy is suggested, followed by a Constellation-wide development plan, three integrated technology demonstrations, and three focused projects for a task order follow-on.
Author
Constellation Program; Composite Structures; Composite Materials; Technology Assessment

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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*.

20080030212 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mars Crustal Dichotomy: Large Lowland Impact Basins may have Formed in Pre-Thinned Crust
Frey, H. V.; March 09, 2008; 2 pp.; In English; Lunar Planetary Science Conference, 9-14 Mar. 2008, Houston, TX, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030212

Crater retention ages of large impact basins on Mars suggest most formed in a relatively short time, perhaps in less than 200 million years. Large basins in the lowlands have thinner central regions than similar size basins in the highlands. Large lowland impact basins, which we previously suggested might explain the low topography and thin crust of the northern part of Mars, may have formed in crust already thinned by yet earlier processes.
Derived from text
Crusts; Craters; Mars Surface; Structural Basins

20080030348 NASA Johnson Space Center, Houston, TX, USA
Oxygen Isotopic Signature of 4.4-3.9 Ga Zircons as a Monitor of Differentiation Processes on the Moon
Nemchin, A. A.; Whitehouse, M. J.; Pidgeon, R. T.; Meyer, C.; Geochimica et Cosmochimica Acta; April 2006; ISSN 0016-7037; Volume 70, Issue 7, pp. 1864-1872; In English; Original contains black and white illustrations
Contract(s)/Grant(s): ARC DP0211706; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.gca.2005.12.009

We report oxygen isotopic compositions for 14 zircon grains from a sample of sawdust from lunar breccia 14321. The zircons range in age from approx.4.4 to 3.9 Ga and in U and Th content from a few to several hundred ppm. As such these grains represent a range of possible source rocks, from granophyric to mafic composition, and cover the total age range of the major initial lunar bombardment. Nevertheless, results show that the oxygen isotopic compositions of the zircons fall within a narrow range of (delta18)O of about 1 per mil and have (delta18)O values indistinguishable from those observed for terrestrial mid-ocean ridge basalts confirming the coincidence of lunar and Earth oxygen isotopic compositions. In the (delta17)O vs. (delta18)O, coordinates data form a tight group with a limited trend on the terrestrial fractionation line. The zircon oxygen isotopes show minimal evidence of the extreme and variable mineral differentiation and element fractionation that have contributed to the formation of their parent rocks.
Author
Oxygen Isotopes; Mineralogy; Rocks; Breccia; Basalt; Isotopic Labeling

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*.

20080030120 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Estimating Irrigation Water Requirements using MODIS Vegetation Indices and Inverse Biophysical Modeling
Imhoff, Marc L.; Bounoua, Lahouari; Harriss, Robert; Harriss, Robert; Wells, Gordon; Glantz, Michael; Dukhovny, Victor A.; Orlovsky, Leah; July 23, 2007; 1 pp.; In English; International Geoscience and Remote Sensing Symposium (IGARSS) meeting, 23-27 Jul. 2007, Barcelona, Spain; Copyright; Avail.: Other Sources; Abstract Only

An inverse process approach using satellite-driven (MODIS) biophysical modeling was used to quantitatively assess water resource demand in semi-arid and arid agricultural lands by comparing the carbon and water flux modeled under both equilibrium (in balance with prevailing climate) and non-equilibrium (irrigated) conditions. Since satellite observations of irrigated areas show higher leaf area indices (LAI) than is supportable by local precipitation, we postulate that the degree to which irrigated lands vary from equilibrium conditions is related to the amount of irrigation water used. For an observation year we used MODIS vegetation indices, local climate data, and the SiB2 photosynthesis-conductance model to examine the relationship between climate and the water stress function for a given grid-cell and observed leaf area. To estimate the

minimum amount of supplemental water required for an observed cell, we added enough precipitation to the prevailing climatology at each time step to minimize the water stress function and bring the soil to field capacity. The experiment was conducted on irrigated lands on the U.S. Mexico border and Central Asia and compared to estimates of irrigation water used. Author

Water Resources; Vegetation; Photosynthesis; MODIS (Radiometry); Imaging Spectrometers; Irrigation; Estimating

20080030198 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA Land Information System (LIS) Water Availability to Support Reclamation ET Estimation

Toll, David; Arsenault, Kristi; Pinheiro, Ana; Peters-Lidard, Christa; Houser, Paul; Kumar, Sujay; Engman, Ted; Nigro, Joe; Triggs, Jonathan; [2005]; 6 pp.; In English; US Bureau of Reclamation Evapotranspiration Workshop, 8-10 Feb. 2005, Ft. Collins, CO, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The U.S. Bureau of Reclamation identified the remote sensing of evapotranspiration (ET) as an important water flux for study and designated a test site in the Lower Colorado River basin. A consortium of groups will work together with the goal to develop more accurate and cost effective techniques using the enhanced spatial and temporal coverage afforded by remote sensing. ET is a critical water loss flux where improved estimation should lead to better management of Reclamation responsibilities. There are several areas where NASA satellite and modeling data may be useful to meet Reclamation's objectives for improved ET estimation. In this paper we outline one possible contribution to use NASA's data integration capability of the Land Information System (LIS) to provide a merger of observational (in situ and satellite) with physical process models to provide estimates of ET and other water availability outputs (e.g., runoff, soil moisture) retrospectively, in near real-time, and also providing short-term predictions.

Author

Water Reclamation; Drainage; Evapotranspiration; Real Time Operation; Remote Sensing; Soil Moisture; River Basins

20080030205 NASA Goddard Space Flight Center, Greenbelt, MD, USA

BRDF of Salt Pan Regolith Samples

Georgiev, Georgi T.; Gatebe, Charles K.; Butler, James J.; King, Michael D.; June 06, 2008; 4 pp.; In English; IGARSS '08/IEEE, 6-11 Jul. 2008, Boston, MA, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Laboratory Bi-directional Reflectance Distribution Function (BRDF) measurements of salt pan regolith samples are presented in this study in an effort to understand the role of spatial and spectral variability of the natural biome. The samples were obtained from Etosha Pan, Namibia (19.20 deg S, 15.93 deg E, alt. 1100 m). It is shown how the BRDF depends on the measurement geometry - incident and scatter angles and on the sample particle sizes. As a demonstration of the application of the results, airborne BRDF measurements acquires with NASA's Cloud Absorption Radiometer (CAR) over the same general site where the regolith samples were collected are compared with the laboratory results. Good agreement between laboratory measured and field measured BRDF is reported.

Author (revised)

Geology; Salts; Regolith; Reflectance; Radiometers; Remote Sensing

20080030228 NASA Goddard Space Flight Center, Greenbelt, MD, USA

A Slow Retrieval Algorithm for Satellite and Surface Based Instruments

Weaver, C.; Flittner, D.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

We present results of a retrieval algorithm for satellite and ground based instruments using the Arizona radiative transfer code. A state vector describing the atmospheric and surface condition is iteratively modified until the calculated radiances match the observed values. Elements of the state vector include: aerosol concentrations, radius, optical properties, mass-weighted altitudes, chlorophyll concentration and wind speed. While computationally expensive, many assumptions used in other retrieval algorithms are not invoked. We present co-located retrievals for MODIS, SEAWIFS and nearby AERONET sites. MODIS AQUA and SEA WIFS: Ten MODIS (.412 - 2.110 microns) and eight SEA WIFS (.412-.865 microns) radiances (.412-.865 microns) include channels where aerosols absorb and reflect radiation. We focus on retrieving bio-mass burning aerosols that are advected over open ocean. Since chlorophyll absorbs at frequencies where black carbon absorbs, our retrieval algorithm accounts for chlorophyll absorption by simultaneously retrieving both aerosol and chlorophyll amount. Our retrieved chlorophyll concentrations are similar to those from the Ocean Color Group. AERONET: Both Almucantar and Principle plane radiances are used to retrieve the state of the atmosphere and ocean conditions. Our retrieved

aerosol size distributions and optical properties are consistent with the aerosol inversions from the AERONET group.
Author
Algorithms; MODIS (Radiometry); Radiative Transfer; Satellite Instruments

20080030242 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Water Vapor Variability - Satellite/Sondes (WAVES) Field Campaigns
Whiteman, D. N.; Adam, M.; Barnet, C.; Bojkov, B.; Delgado, R.; Demoz, B.; Fitzgibbon, J.; Forno, R.; Herman, R.; Hoff, E.; Joseph, E.; Landulfo, E.; McCann, K.; McGee, T.; Miloshevich, L.; Restrepo, I.; Schmidlin, F. J.; Taubman, B.; Thompson, A.; Twigg, L.; Venable, D.; Vomel, H.; Walthall, C.; July 07, 2008; 4 pp.; In English; Laboratorio de Fisica de la Atmosfera/Universidad mayor de San Andres Meeting, 7-11 Jul. 2008, La Paz, Bolivia; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Three NASA-funded field campaigns have been hosted at the Howard University Research Campus in Beltsville, MD. In each of the years 2006, 2007 and 2008, WAVES field campaigns have coordinated ozonesonde launches, lidar operations and other measurements with A-train satellite overpasses for the purposes of satellite validation. The unique mix of measurement systems, physical location and the interagency, international group of researchers and students has permitted other objectives, such as mesoscale meteorological studies, to be addressed as well. We review the goals and accomplishments of the three WAVES missions with the emphasis on the nonsatellite validation component of WAVES, as the satellite validation activities have been reported elsewhere.
Author
Water Vapor; Variability; Optical Radar; Radiosondes; Precipitation Measurement; Data Acquisition; Proving

20080030250 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Assessment of Current Satellite Precipitation Algorithms
Smith, Eric A.; October 14, 2007; 1 pp.; In English; First Workshop on the Satellite Application Facility in Support of Operational Hydrology and Water Management, 14-23 Oct. 2007, Rome, Italy; No Copyright; Avail.: Other Sources;
Abstract Only

The H-SAF Program requires an experimental operational European-centric Satellite Precipitation Algorithm System (E-SPAS) that produces medium spatial resolution and high temporal resolution surface rainfall and snowfall estimates over the Greater European Region including the Greater Mediterranean Basin. Currently, there are various types of experimental operational algorithm methods of differing spatiotemporal resolutions that generate global precipitation estimates. This address will first assess the current status of these methods and then recommend a methodology for the H-SAF Program that deviates somewhat from the current approach under development but one that takes advantage of existing techniques and existing software developed for the TRMM Project and available through the public domain.
Author
Satellite Observation; Precipitation (Meteorology); Precipitation Measurement; Algorithms; Spatial Resolution; Temporal Resolution; Computer Programs; Data Processing

20080030257 NASA Goddard Space Flight Center, Greenbelt, MD, USA
TRMM Gridded Text Products
Stocker, Erich Franz; April 13, 2007; 33 pp.; In English; European Geosciences General Assembly 2008, 13-18 Apr. 2007, Vienna, Austria; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

NASA's Tropical Rainfall Measuring Mission (TRMM) has many products that contain instantaneous or gridded rain rates often among many other parameters. However, these products because of their completeness can often seem intimidating to users just desiring surface rain rates. For example one of the gridded monthly products contains well over 200 parameters. It is clear that if only rain rates are desired, this many parameters might prove intimidating. In addition, for many good reasons these products are archived and currently distributed in HDF format. This also can be an inhibiting factor in using TRMM rain rates. To provide a simple format and isolate just the rain rates from the many other parameters, the TRMM product created a series of gridded products in ASCII text format. This paper describes the various text rain rate products produced. It provides detailed information about parameters and how they are calculated. It also gives detailed format information. These products are used in a number of applications with the TRMM processing system. The products are produced from the swath instantaneous rain rates and contain information from the three major TRMM instruments: radar, radiometer, and combined. They are simple to use, human readable, and small for downloading.
Author (revised)
TRMM Satellite; Data Products; Information Retrieval; Texts; Format; Rain; Precipitation Measurement

20080030266 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Long-term Satellite Observations of Asian Dust Storm: Source, Pathway, and Interannual Variability

Hsu, N. Christina; June 2008; 1 pp.; In English; First International Conference: From Deserts to Monsoons/Segean Conferences, Inc., 1-6 Jun. 2008, Crete, Greece; No Copyright; Avail.: Other Sources; Abstract Only

Among the many components that contribute to air pollution, airborne mineral dust plays an important role due to its biogeochemical impact on the ecosystem and its radiative-forcing effect on the climate system. In East Asia, dust storms frequently accompany the cold and dry air masses that occur as part of springtime cold front systems. Outbreaks of Asian dust storms occur often in the arid and semi-arid areas of northwestern China -about 1.6x10(exp 6) square kilometers including the Gobi and Taklimakan deserts- with continuous expanding of spatial coverage. These airborne dust particles, originating in desert areas far from polluted regions, interact with anthropogenic sulfate and soot aerosols emitted from Chinese megacities during their transport over the mainland. Adding the intricate effects of clouds and marine aerosols, dust particles reaching the marine environment can have drastically different properties than those from their sources. Furthermore, these aerosols, once generated over the source regions, can be transported out of the boundary layer into the free troposphere and can travel thousands of kilometers across the Pacific into the USA and beyond. In this paper, we will demonstrate the capability of a new satellite algorithm to retrieve aerosol properties (e.g., optical thickness, single scattering albedo) over bright-reflecting surfaces such as urban areas and deserts. Such retrievals have been difficult to perform using previously available algorithms that use wavelengths from the mid-visible to the near IR because they have trouble separating the aerosol signal from the contribution due to the bright surface reflectance. This new algorithm, called Deep Blue, utilizes blue-wavelength measurements from instruments such as SeaWiFS and MODIS to infer the properties of aerosols, since the surface reflectance over land in the blue part of the spectrum is much lower than for longer wavelength channels. Reasonable agreements have been achieved between Deep Blue retrievals of aerosol optical thickness and those directly from AERONET sunphotometers over desert and semi-desert regions. New Deep Blue products will allow scientists to determine quantitatively the aerosol properties near sources using high spatial resolution measurements from SeaWiFS and MODIS-like instruments. Long-term satellite measurements (1998 - 2007) from SeaWiFS will be utilized to investigate the interannual variability of source, pathway, and dust loading associated with the Asian dust storm outbreaks. In addition, monthly averaged aerosol optical thickness during the springtime from SeaWiFS will also be compared with the MODIS Deep Blue products.

Author

Asia; Satellite Observation; Dust Storms; Annual Variations; Ecosystems; Remote Sensing

20080030267 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Ground-based SMART-COMMIT Measurements for Studying Aerosol and Cloud Properties

Tsay, Si-Chee; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

From radiometric principles, it is expected that the retrieved properties of extensive aerosols and clouds from reflected/emitted measurements by satellite (and/or aircraft) should be consistent with those retrieved from transmitted/emitted radiance observed at the surface. Although space-borne remote sensing observations cover large spatial domain, they are often plagued by contamination of surface signatures. Thus, ground-based in-situ and remote-sensing measurements, where signals come directly from atmospheric constituents, the sun, and/or the Earth-atmosphere interactions, provide additional information content for comparisons that confirm quantitatively the usefulness of the integrated surface, aircraft, and satellite data sets. The development and deployment of SMARTCOMMIT (Surface-sensing Measurements for Atmospheric Radiative Transfer - Chemical, Optical & Microphysical Measurements of In-situ Troposphere) mobile facilities are aimed for the optimal utilization of collocated ground-based observations as constraints to yield higher fidelity satellite retrievals and to determine any sampling bias due to target conditions. To quantify the energetics of the surface-atmosphere system and the atmospheric processes, SMART-COMMIT instruments fall into three categories: flux radiometer, radiance sensor and in-situ probe. In this paper, we will demonstrate the capability of SMART-COMMIT in recent field campaigns (e.g., CRYSTAL-FACE, UAE 2, BASEASIA, NAMMA) that were designed and executed to study the compelling variability in temporal scale of both anthropogenic and natural aerosols (e.g., biomass-burning smoke, airborne dust) and cirrus clouds. We envision robust approaches in which well-collocated ground-based measurements and space-borne observations will greatly advance our knowledge of extensive aerosols and clouds.

Author

Atmospheric Composition; In Situ Measurement; Optical Measurement; Radiative Transfer; Remote Sensing; Troposphere; Ground Based Control

20080030345 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Comparison of Satellite-Derived and In-Situ Observations of Ice and Snow Surface Temperatures over Greenland

Hall, Dorothy K.; Box, Jason E.; Casey, Kimberly A.; Hook, Simon J.; Shuman, Christopher A.; Steffen, Konrad; [2008]; 35 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The most practical way to get a spatially broad and continuous measurements of the surface temperature in the data-sparse cryosphere is by satellite remote sensing. The uncertainties in satellite-derived LSTs must be understood to develop internally-consistent decade-scale land-surface temperature (LST) records needed for climate studies. In this work we assess satellite-derived 'clear-sky' LST products from the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), and LSTs derived from the Enhanced Thematic Mapper Plus (ETM+) over snow and ice on Greenland. When possible, we compare satellite-derived LSTs with in-situ air-temperature observations from Greenland Climate Network (GC-Net) automatic-weather stations (AWS). We find that MODIS, ASTER and ETM+ provide reliable and consistent LSTs under clear-sky conditions and relatively-flat terrain over snow and ice targets over a range of temperatures from -40 to 0 C. The satellite-derived LSTs agree within a relative RMS uncertainty of approx.0.5 C. The good agreement among the LSTs derived from the various satellite instruments is especially notable since different spectral channels and different retrieval algorithms are used to calculate LST from the raw satellite data. The AWS record in-situ data at a 'point' while the satellite instruments record data over an area varying in size from: 57 X 57 m (ETM+), 90 X 90 m (ASTER), or to 1 X 1 km (MODIS). Surface topography and other factors contribute to variability of LST within a pixel, thus the AWS measurements may not be representative of the LST of the pixel. Without more information on the local spatial patterns of LST, the AWS LST cannot be considered valid ground truth for the satellite measurements, with RMS uncertainty approx.2 C. Despite the relatively large AWS-derived uncertainty, we find LST data are characterized by high accuracy but have uncertain absolute precision.

Author

Cryospheres; Surface Temperature; Temperature Measurement; Remote Sensing; MODIS (Radiometry); Thematic Mappers (Landsat); Thermal Emission

20080030358 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Managing Uncertainty Due to a Fundamental Error Source Arising from Scatterer Distribution Complexity in Radar Remote Sensing of Precipitation

Smith, Eric A.; Kuo, Kwo-Sen; Meneghini, Robert; Mugnai, Alberto; November 10, 2007; 1 pp.; In English; 9th International Precipitation Conference, 10-17 Nov. 2007, Paris, France; Copyright; Avail.: Other Sources; Abstract Only

The assumption that cloud and rain drops are spatially distributed according to a Poisson distribution within a scattering volume probed by a radar being used to estimate precipitation has represented bedrock theory in establishing 'rules of the game' for pulse averaging--the process needed to beat down noise to an acceptable level in the measurement of radar reflectivity factor. Based on relatively recent observations of 'realistic' spatial distributions of hydrometeor scatterers in a cloudy atmosphere motivates a renewed examination of the consequences of using a too simplified assumption underlying volume scattering--particularly in regards to the standard pulse averaging rule. Our investigation addresses two extremes, simple to complex, insofar as allowed for complexities in an underlying scatterer distribution. It is demonstrated that as the spatial distribution ranges from Poisson (a narrow distribution) to multi-fractal (much broader distribution), uncertainty in a measurement increases if the rule for pulse averaging goes unchanged from its Poisson distribution reference county. [A bounded cascade is used for the multi-fractal distribution, a regularly observed distribution vis-a-vis cloud liquid water content.] The resultant measurement uncertainty leads to a fundamental source of error in the estimation of rain rate from radar measurements, one that has been disregarded since the early 1950s when radar sets first began to be used for rainfall measuring. It is shown how this source of error can be 'managed'--under the assumption that number of data analysis experiments would be carried out, experiments involving pulse-by-pulse measurements obtained from a radar set modified to output individual pulses of reflectivity factor. For practical applications, a new parameter called normalized k-sample intensity invariance is developed to enable defining the required pulse average count according to a preferred degree of uncertainty.

Author

Precipitation Measurement; Remote Sensing; Radar Measurement; Meteorological Radar; Rain; Scattering; Data Processing; Error Analysis

20080030374 NASA Langley Research Center, Hampton, VA, USA

Assessment of the Visible Channel Calibrations of the TRMM VIRS and MODIS on Aqua and Terra

Minnis, Patrick; Doelling, David R.; Nguyen, Louis; Miller, Walter F.; Chakrapani, Venketesan; April 2007; 52 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 720817.04.07.01; Copyright; Avail.: CASI: A04, Hardcopy

Several recent research satellites carry self-calibrating multispectral imagers that can be used for calibrating operational imagers lacking complete self-calibrating capabilities. In particular, the visible (VIS, 0.65 m) channels on operational meteorological satellites are generally calibrated before launch, but require vicarious calibration techniques to monitor the gains and offsets once they are in orbit. To ensure that the self-calibrating instruments are performing as expected, this paper examines the consistencies between the VIS channel (channel 1) reflectances of the Moderate Resolution Imaging Spectroradiometer (MODIS) instruments on the Terra and Aqua satellites and the Version 5a and 6 reflectances of the Visible Infrared Scanner (VIRS) on the Tropical Rainfall Measuring Mission using a variety of techniques. These include comparisons of Terra and Aqua VIS radiances with coincident broadband shortwave radiances from the well-calibrated Clouds and the Earth s Radiant Energy System (CERES), time series of deep convective cloud (DCC) albedos, and ray-matching intercalibrations between each of the three satellites. Time series of matched Terra and VIRS data, Aqua and VIRS data, and DCC reflected fluxes reveal that an older version (Version 5a, ending in early 2004) of the VIRS calibration produced a highly stable record, while the latest version (Version 6) appears to overestimate the sensor gain change by approx.1%/y as the result of a manually induced gain adjustment. Comparisons with the CERES shortwave radiances unearthed a sudden change in the Terra MODIS calibration that caused a 1.17% decrease in the gain on 19 November 2003 that can be easily reversed. After correction for these manual adjustments, the trends in the VIRS and Terra channels are no greater than 0.1%/y. Although the results were more ambiguous, no statistically significant trends were found in the Aqua MODIS channel-1 gain. The Aqua radiances are 1% greater, on average, than their Terra counterparts, and after normalization are 4.6% greater than VIRS radiances, in agreement with theoretical calculations. The discrepancy between the two MODIS instruments should be taken into account to ensure consistency between parameters derived from them. With the adjustments, any of the three instruments can serve as references for calibrating other satellites. Monitoring of the calibrations continues in near-real-time and the results are available via the world wide web.

Author

Meteorological Satellites; MODIS (Radiometry); TRMM Satellite; Calibrating; Intercalibration; Real Time Operation; Aqua Spacecraft; Terra Spacecraft; Broadband; Imaging Spectrometers

20080030487 Naval Postgraduate School, Monterey, CA USA

Toward Accurate Coastal Ocean Prediction

Chu, Peter C; Nov 28, 2000; 7 pp.; In English

Report No.(s): AD-A479923; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479923

Several major problems, namely, uncertain surface forcing function, unknown open boundary conditions (OBC), and pressure gradient error using the acoordinate, affect the accuracy of coastal ocean prediction. At open lateral boundaries where the numerical grid ends, the fluid motion should be unrestricted. Ideal open boundaries are transparent to motions. The most popular and successful scheme is the adjoint method. The disadvantages that may restrict its use are ocean-model dependency and difficulty in deriving the adjoint equation when the model contains rapid (discontinuous) processes, such as change of ocean mixed layer from entrainment to shallowing regime. Development of a ocean-model independent algorithm for determining the OBC becomes urgent.

DTIC

Coasts; Oceanography; Oceans

20080030787

Air Quality Research and Applications Using AURA OMi Data

December 2007; 1 pp.; No Copyright; Avail.: Other Sources; Abstract Only

The Ozone Monitoring Instrument (OMI) on EOS Aura is a new generation of satellite remote sensing instrument designed to measure trace gas and aerosol absorption at the UV and blue wavelengths. These measurements are made globally at urban scale resolution with no inter-orbital gaps that make them potentially very useful for air quality research, such as the determination of the sources and processes that affect global and regional air quality, and to develop applications such as air quality forecast. However, the use of satellite data for such applications is not as straight forward as satellite data have been for stratospheric research. There is a need for close interaction between the satellite product developers, in-situ measurement

programs, and the air quality research community to overcome some of the inherent difficulties in interpreting data from satellite-based remote sensing instruments. In this talk we will discuss the challenges and opportunities in using OMI products for air quality research and applications. A key conclusion of this work is that to realize the full potential of OMI measurements it will be necessary to combine OMI data with data from instruments such as MLS, MODIS, AIRS, and CALIPSO that are currently flying in the 'A-train' satellite constellation. In addition similar data taken by satellites crossing the earth at different local times than the A-train (e.g., the recently MetOp satellite) would need to be processed in a consistent manner to study diurnal variability, and to capture the effects on air quality of rapidly changing events such as wild fires.
Author
Air Quality; Ozone; Remote Sensing; Earth Observing System (EOS); Aura Spacecraft

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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*.

20080026313 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Savings Potential of Energy Star External Power Adapters and Battery Chargers
Webber, C.; Korn, D.; Sanchez, M.; Feb. 2007; 15 pp.; In English
Report No.(s): DE2007-913165; LBNL-62399; No Copyright; Avail.: National Technical Information Service (NTIS)

External power adapters may lose 10 to 70 percent of the energy they consume, dissipated as heat rather than converted into useful energy. Battery charging systems have more avenues for losses: in addition to power conversion losses, power is consumed by the charging circuitry, and additional power may be needed after the battery is full charged to balance self-discharge. In 2005, the Environmental Protection Agency launched a new ENERGY STAR(R) label for external power supplies (EPSs) that convert line-voltage AC electricity into low-voltage DC electricity for certain electronic devices. The specification included power supplies for products with battery charging functions (e.g. laptops and cell phones), but excluded others. In January 2006, a separate specification was issued for battery charging systems contained primarily in small household appliances and power tools. In addition to the ENERGYSTAR(R) label, the state of California will implement minimum energy performance standards for EPSs in 2007, and similar standards for EPSs and battery chargers are in development at the national level. Many of the products covered by these policies use relatively little power and have modest per-unit savings potential compared to conventional energy efficiency targets. But with an estimated 1.5 billion adapters and 230 million battery charging systems in use in the USA, the aggregate savings potential is quite high. This paper presents estimates of the savings potential for external power adapters and battery charging systems through 2025.
NTIS
Battery Chargers; Potential Energy; Electric Batteries; Recharging; Charge Efficiency

20080026316 Sandia National Labs., Albuquerque, NM USA
Remote Area Power Supply (RAPS) Load and Resource Profiles. A Study for the DOE Energy Storage Program
Fall, N.; Giles, L.; Marchionini, B.; Skolnik, E. G.; Jul. 2007; 46 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2007-912664; SAND2007-4268; No Copyright; Avail.: National Technical Information Service (NTIS)

In 1997, an international team interested in the development of Remote Area Power Supply (RAPS) systems for rural electrification projects around the world was organized by the International Lead Zinc Research Organization (ILZRO) with the support of Sandia National Laboratories (SNL). The team focused on defining load and resource profiles for RAPS systems. They identified single family homes, small communities, and villages as candidates for RAPS applications, and defined several different size/power requirements for each. Based on renewable energy and resource data, the team devised a strawman series of load profiles. A RAPS system typically consists of a renewable and/or conventional generator, power conversion equipment, and a battery. The purpose of this report is to present data and information on insolation levels and load requirements for typical homes, small communities, and larger villages around the world in order to facilitate the development of robust design practices for RAPS systems, and especially for the storage battery component. These systems could have significant impact on areas of the world that would otherwise not be served by conventional electrical grids.
NTIS
Energy Storage; Loads (Forces); Supplying

20080029298 Texas Univ., Austin, TX, USA

Prompt Gamma-Ray Activation Analysis of Lithium Ion Battery Cathodes. Final Scientific/Technical Report covering August 15, 2004 to August 14, 2006

Manthiram, A.; Landsberger, S.; Nov. 12, 2006; 32 pp.; In English

Contract(s)/Grant(s): DE-FG07-04ID14610

Report No.(s): DE2007-894912; No Copyright; Avail.: Department of Energy Information Bridge

Over the course of the last two years of the NEER grant, a number of lithium ion battery cathode (positive electrode) materials have been characterized using prompt gamma-ray activation analysis (PGAA). The PGAA data have been complemented by other, more traditional, analytical, chemical, and structural characterization techniques such as X-ray diffraction (XRD), atomic absorption spectroscopy (AAS), wet chemical redox titration, and thermogravimetric (TGA) analysis available at the University of Texas at Austin (UT Austin). The utilization of PGAA for the analysis of lithium ion battery cathodes had never been undertaken before our study was conducted, and it has proved to be a novel approach to develop a better understanding of the behavior of lithium ion battery cathodes. The purpose of our investigation was to gain an understanding of the factors that control the reversible capacity limits of lithium ion battery cathodes and their failure mechanisms. This project was a multidisciplinary investigation involving aspects of materials science and nuclear engineering. The facilities available at both the Nuclear Engineering Teaching Laboratory (NETL) and the Texas Materials Institute (TMI) located at UT Austin were instrumental in carrying out this investigation.

NTIS

Activation Analysis; Cathodes; Electric Batteries; Gamma Rays; Lithium; Metal Ions

20080029310 Army Research Lab., Aberdeen Proving Ground, MD USA

Design and Response of a Structural Multifunctional Fuel Cell

South, Joseph; Baechle, Daniel; Hilton, Corydon; DeSchepper, Daniel; Wetzel, Eric; Mar 2008; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479096; ARL-TR-4400; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479096

Many U.S. Army systems, such as ground vehicles and fully equipped Soldiers, are comprised of multiple subcomponents which each typically perform unique functions. Combining these functions into a single, multifunctional component may reduce mass and improve overall system efficiency. Of particular interest are structural materials that also provide power-generating or energy-storing capacity and could provide significant weight savings over a range of platforms. In this study, structural fuel cells are proposed and evaluated. A structural multifunctional fuel cell system is designed so that material elements participating in power and energy processes are also carrying significant structural loads. This synergistic approach allows for mass savings through a multifunctional design. Fabrication and design details for this multifunctional system, as well as structural and power/energy performance results, are reported. Critical material properties and fabrication considerations are highlighted, and important technical challenges are identified.

DTIC

Fuel Cells; Loads (Forces); Fabrication; System Effectiveness; Structural Stability

20080029325 Army Power Div., Fort Belvoir, VA USA

History of Fuel Cell R&D at Fort Belvoir, Virginia

Taschek, Walter G; Apr 1, 2008; 18 pp.; In English

Report No.(s): AD-A479094; APPT-TR-08-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479094

Fuel cell R&D in the USA before 1958 was minimal but, with the advent of Sputnik, interest in fuel cells exploded. While NASA pursued fuel cells for space applications, Army Labs at Fort Monmouth and Fort Belvoir pursued air breathing fuel cells for tactical and ground applications. By the mid 1960's, both Army Labs had strong efforts and each had staffs of over eight researchers directed at fuel cell technology.

DTIC

Fuel Cells; Technology Utilization

20080030122 McNees, Wallace and Nurick, Harrisburg, PA, USA

Solar Cells Having a Transparent Composition-Graded Buffer Layer

King, R. R., Inventor; Fetzer, C. M., Inventor; Colter, P. C., Inventor; 15 Jun 04; 15 pp.; In English

Contract(s)/Grant(s): F-29601-98-2-0207

Patent Info.: Filed Filed 15 Jun 04; US-Patent-Appl-SN-10-868-080
Report No.(s): PB2007-110678; No Copyright; Avail.: CASI: A03, Hardcopy

A solar cell includes a first layer having a first-layer lattice parameter, a second layer having a second-layer lattice parameter different from the first-layer lattice parameter, wherein the second layer includes a photoactive second-layer material; and a third layer having a third-layer lattice parameter different from the second-layer lattice parameter, wherein the third layer includes a photoactive third-layer material. A transparent buffer layer extends between and contacts the second layer and the third layer and has a buffer-layer lattice parameter that varies with increasing distance from the second layer toward the third layer, so as to lattice match to the second layer and to the third layer. There may be additional subcell layers and buffer layers in the solar cell.

NTIS

Patent Applications; Solar Cells; Transparence

20080030125 McNees, Wallace and Nurick, Harrisburg, PA, USA; Boeing Co., Chicago, IL, USA

Multijunction Solar Cell Having a Lattice Mismatched GRIII-GRV-X Layer and a Composition-Graded Buffer Layer

Fetzer, C. M., Inventor; King, R. R., Inventor; Colter, P. C., Inventor; 15 Jun 04; 9 pp.; In English
Contract(s)/Grant(s): F-29601-98-2-0207
Patent Info.: Filed Filed 15 Jun 04; US-Patent-Appl-SN-10-868-079
Report No.(s): PB2007-110677; No Copyright; Avail.: CASI: A02, Hardcopy

A multijunction solar cell includes a first photoactive subcell layer having a first-subcell lattice parameter and a composition including (1) at least one Group III element, at least one Group V element other than (nitrogen, phosphorus), and (nitrogen, phosphorus), or (2) a material selected from the group including GaInAsBi, GaInAsSb, GaInAsP, ZnGeAs(sub 2), or BGaInAs. The multijunction solar cell also has a substrate having a substrate lattice parameter different from the first-subcell lattice parameter, and a composition-graded buffer layer between the first photoactive subcell layer and the substrate and having a buffer-layer lattice parameter graded between the first-subcell lattice parameter and the substrate lattice parameter. The substrate may be a second photoactive subcell layer having a second-subcell lattice parameter different from the first-subcell lattice parameter and sensitive to a second-photoactive-subcell-layer wavelength, and the buffer layer is transparent to the second-photoactive-subcell-layer wavelength.

NTIS

Patent Applications; Solar Cells; Gallium Phosphides; Indium Arsenides; Indium Phosphides

20080030366 Perot Systems Corp., Greenbelt, MD, USA

DC/DC Converter Stability Testing Study

Wang, Bright L.; July 2008; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): ESES 260; GSS-05-S-246
Report No.(s): NASA/CR-2008-214163; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030366

This report presents study results on hybrid DC/DC converter stability testing methods. An input impedance measurement method and a gain/phase margin measurement method were evaluated to be effective to determine front-end oscillation and feedback loop oscillation. In particular, certain channel power levels of converter input noises have been found to have high degree correlation with the gain/phase margins. It becomes a potential new method to evaluate stability levels of all type of DC/DC converters by utilizing the spectral analysis on converter input noises.

Author

Voltage Converters (DC to DC); Impedance Measurement; Stability Tests; Spectrum Analysis

20080030415 Army War Coll., Carlisle Barracks, PA USA

It's Time for a National Energy Security Strategy

Wright, George G; Mar 20, 2008; 33 pp.; In English
Report No.(s): AD-A479741; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479741

The USA has been unchallenged as the sole economic and military superpower in the world over the last 15 years. However a near decade long volatility in energy markets has led some Americans to question whether the U.S. can preserve that standing in the world. Colonel Greg Wright argues that what is needed to retain our military and economic superpower advantage is a new overarching USA National Energy Security Strategy. This new National Energy Security Strategy should

set the strict goal of making the USA energy independent by 2020; its essential components should include diversifying and increasing energy supplies increasing conservation decreasing greenhouse gas emissions and modernizing energy distribution and production systems.
DTIC
Energy Consumption; Fuel Consumption; Greenhouse Effect; International Relations; Security

20080030466 Army Research Lab., Aberdeen Proving Ground, MD USA
Multifunctional Structural Power and Energy Composites for U.S. Army Applications
Wetzel, Eric D; O'Brien, Daniel J; Snyder, James F; Carter, Robert H; South, Joseph T; Oct 2006; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479859; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479859
No abstract available
Armor; Electrolytic Cells; Fuel Cells

20080030596 Library of Congress, Washington, DC USA
Russian Energy Policy Toward Neighboring Countries
Woehrel, Steven; Jan 17, 2008; 25 pp.; In English
Report No.(s): AD-A480028; CRS-RL34261; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Russian oil and natural gas industries are increasingly important players in the global energy market, particularly in Europe and Eurasia. Another trend has been the increasing concentration of these industries in the hands of the Russian government. This latter phenomenon has been accompanied by an increasingly authoritarian political system, in which former intelligence officers play key roles. Russian firms have tried to purchase a controlling stake in pipelines, ports, storage facilities, and other key energy assets of the countries of central and eastern Europe. They need these assets to transport energy supplies to lucrative western European markets, as well as to secure greater control over the domestic markets of the countries of the region. In several cases where assets were sold to non-Russian firms, Russian firms cut off energy supplies to the facilities. Russia has also tried to build new pipelines to circumvent infrastructure that it does not control. Another objective Russia has pursued has been to eliminate the energy subsidies former Soviet republics have received since the fall of the Soviet Union, including by raising the price these countries pay for natural gas to world market prices.
DTIC
Energy Policy; Foreign Policy

20080030648 Pennsylvania State Univ., University Park, PA USA
Summary of Recent Hybrid Torpedo Powerplant Studies
Peters, Jonathan A; Dec 2007; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-05-G-0106
Report No.(s): AD-A480200; PSU/ARL-TR-07-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Hybrid torpedoes incorporate multiple propulsion subsystems, optimized for different power levels. This allows these weapons to operate more efficiently over a wide range of speeds, which may give tactical advantages in certain engagement scenarios. After a brief general discussion of the hybrid torpedo concept, a parametric analysis comparing hybrid and conventional torpedo ranges is presented. The distinctions between hybrid torpedoes and weaponized Unmanned Undersea Vehicles (UUVs) are enumerated. Powerplant component models, including the THERMHYB tool, are discussed. A trade study, performed to identify key enabling technologies for hybrid weapons, is presented. Ongoing and future efforts are described.
DTIC
Electric Power Plants; Torpedoes

20080030798 National Energy Technology Lab., Albany, OR, USA
Determining the Cause of a Header Failure in a Natural Gas Production Facility
Matthes, S. A.; Covino, B. S.; Bullard, S. J.; Moroz, M. Z.; Holcomb, G. R.; Mar. 01, 2007; 48 pp.; In English
Report No.(s): DE2007-913151; DOE/NETL-IR-2007-01; No Copyright; Avail.: National Technical Information Service (NTIS)
An investigation was made into the premature failure of a gas-header at the Rocky Mountain Oilfield Testing Center

(RMOTC) natural gas production facility. A wide variety of possible failure mechanisms were considered: design of the header, deviation from normal pipe alloy composition, physical orientation of the header, gas composition and flow rate, type of corrosion, protectiveness of the interior oxide film, time of wetness, and erosion-corrosion. The failed header was examined using metallographic techniques, scanning electron microscopy, and microanalysis. A comparison of the failure site and an analogous site that had not failed, but exhibited similar metal thinning was also performed. From these studies it was concluded that failure resulted from erosion-corrosion, and that design elements of the header and orientation with respect to gas flow contributed to the mass loss at the failure point.
NTIS
Corrosion; Natural Gas; Structural Failure; Cumulative Damage

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20080026245 NASA Langley Research Center, Hampton, VA, USA
Attribution of Recovery in Lower-stratospheric Ozone
Yang, Eun-Su; Cunnold, Derek M.; Salawitch, Ross J.; McCormick, M. Patrick; Russell, James, III; Zawodny, Joseph M.; Oltmans, Samuel; Newchurch, Michael J.; [2006]; 48 pp.; In English
Contract(s)/Grant(s): WBS 895632.04.07.01; Copyright; Avail.: CASI: A03, Hardcopy

Multiple satellite and ground-based observations provide consistent evidence that the thickness of Earth's protective ozone layer has stopped declining since 1997, close to the time of peak stratospheric halogen loading. Regression analyses with Effective Equivalent Stratospheric Chlorine (EESC) in conjunction with further analyses using more sophisticated photochemical model calculations constrained by satellite data demonstrate that the cessation of ozone depletion between 18-25 km altitude is consistent with a leveling off of stratospheric abundances of chlorine and bromine, due to the Montreal Protocol and its amendments. However, ozone increases in the lowest part of the stratosphere, from the tropopause to 18 km, account for about half of the improvement in total column ozone during the past 9 years at northern hemisphere mid-latitudes. The increase in ozone for altitudes below 18 km is most likely driven by changes in transport, rather than driven by declining chlorine and bromine. Even with this evidence that the Montreal Protocol and its amendments are having the desired, positive effect on ozone above 18 km, total column ozone is recovering faster than expected due to the apparent transport driven changes at lower altitudes. Accurate prediction of future levels of stratospheric ozone will require comprehensive understanding of the factors that drive temporal changes at various altitudes, and partitioning of the recent transport-driven increases between natural variability and changes in atmospheric structure perhaps related to anthropogenic climate change. Author
Ozone Depletion; Ozonosphere; Stratosphere; Earth Surface; Mathematical Models; Atmospheric Composition

20080026321 Pruet (Nexsen), LLP, Grenville, SC, USA
Clamshell Closure for Metal Drum
Blanton, P. S., Inventor; 16 May 05; 5 pp.; In English
Contract(s)/Grant(s): DE-AC09-96-SR18500
Patent Info.: Filed Filed 16 May 05; US-Patent-Appl-SN-11-130-043
Report No.(s): PB2007-110524; No Copyright; Avail.: CASI: A01, Hardcopy

Closure ring to retain a lid in contact with a metal drum in central C-section conforming to the contact area between a lid and the rim of a drum and further having a radially inwardly directed flange and a vertically downwardly directed flange attached to the opposite ends of the C-section. The additional flanges reinforce the top of the drum by reducing deformation when the drum is dropped and maintain the lid in contact with the drum. The invention is particularly valuable in transportation and storage of fissile material.
NTIS
Flanges; Patent Applications; Radioactive Wastes

20080029295 Sierra Nevada Research Inst., Merced, CA, USA

Contaminant Organic Complexes: Their Structure and Energetics in Surface Decontamination. Technical Report for Performance Period July 1, 2003 to September 14, 2006

Traina, S. J.; Sharma, S.; Jan. 29, 2007; 9 pp.; In English

Contract(s)/Grant(s): DE-FG02-03ER63586

Report No.(s): DE2007-902502; No Copyright; Avail.: National Technical Information Service (NTIS)

The Department of Energy has a goal of decontaminating an estimated 180,000 metric tons of metal wastes in various surplus facilities. Uranium (U) and other radioactive actinides and lanthanides are embedded within the mixed oxide structures of the passivity layers of corroded iron and steel. These toxic metals can be dissolved out of the surface layers by a naturally occurring bacterial siderophore called Desferrioxamine B (DFB). DFB is a trihydroxamate ligand with one amine (pK1 =10.89) and three hydroxamate groups (pK2 =9.70, pK3 =9.03, and pK4 =8.30), which chelates with metals through hydroxamate coordination. Complexation of DFB with U can be utilized in decontamination strategy of the passivity layers. Therefore, we have been studying reactions of uranyl U(VI) with zerovalent iron (Fe0) followed by dissolution by DFB. The objectives were to determine the structure and speciation of solution and solid phases of U and to assess the effectiveness of DFB in U dissolution.

NTIS

Contaminants; Decontamination; Dissolving; Metals

20080030202 Moser, Patterson, Sheridan, LLP, Shrwesbury, NJ, USA

Method and Apparatus for Airborne Particle Collection

Coyle, P. J., Inventor; Pletcher, T. A., Inventor; 27 May 05; 22 pp.; In English

Contract(s)/Grant(s): DARPA-DMD13-03-C-0041; ARMYACQCTR-W911SR-04-C-0025

Patent Info.: Filed Filed 27 May 05; US-Patent-Appl-SN-11-140-124

Report No.(s): PB2007-110672; No Copyright; Avail.: CASI: A03, Hardcopy

Embodiments of an apparatus for collecting biological aerosols from an air sample include a hollow tube adapted for pumping a liquid through an interior volume to an outer surface and a collection surface disposed on the outer surface and adapted for collecting the airborne particles from the surrounding air sample. Collection efficiency is enhanced by a charging mechanism that applies a charge to the airborne particles such that the airborne particles are deflected toward the collection surface. Embodiments of operation for the apparatus include the steps of providing the air sample, directing the air sample toward the hollow tube, and applying a charge to the airborne particles such that the airborne particles deposit on the collection surface/outer surface of said hollow tube.

NTIS

Aerosols; Air Pollution; Monitors; Patent Applications

20080030208 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Air Quality Study Using Satellites - Current Capability and Future Plans

Bhartia, Pawan K.; Joiner, Joanna; Gleason, James; Liu, Xiong; Torres, Omar; Krotkov, Nickolay; Ziemke, Jerry; Chandra, Sushil; [2008]; 1 pp.; In English; International Radiation Symposium 2008, 1-10 Aug. 2008, Foz do Iguacu, Brazil; No Copyright; Avail.: Other Sources; Abstract Only

Satellite instruments have had great success in monitoring the stratospheric ozone and in understanding the processes that control its daily to decadal scale variations. This field is now reaching its zenith with a number of satellite instruments from the US, Europe and Canada capping several decades of active research in this field. The primary public policy imperative of this research was to make reliable prediction of increases in biologically active surface UV radiation due to human activity. By contrast retrieval from satellite data of atmospheric constituents and photo-chemically active radiation that affect air quality is a new and growing field that is presenting us with unique challenges in measurement and data interpretation. A key distinction compared to stratospheric sensors is the greatly enhanced role of clouds, aerosols, and surfaces (CAS) in determining the quality and quantity of useful data that is available for air quality research. In our presentation we will use data from several sensors that are currently flying on the A-train satellite constellation, including OMI, MODIS, CLOUDSAT, and CALIPSO, to highlight that CAS can have both positive and negative effects on the information content of satellite measurements. This is in sharp contrast to other fields of remote sensing where CAS are usually considered an interference except in those cases when they are the primary subject of study. Our analysis has revealed that in the reflected wavelengths one often sees much further down into the atmosphere, through most cirrus, than one does in the emitted wavelengths. The lower level clouds provide a nice background against which one can track long-range transport of trace gases and aerosols. In addition, differences in trace gas columns estimated over cloudy and adjacent clear pixels can be used to measure boundary

layer trace gases. However, in order to take full advantage of these features it will be necessary to greatly advance our understanding of how CAS affect the radiation at wavelengths that are used to derive the atmospheric constituents that affect air quality as well as the radiation that controls the photolysis of chemically active trace gases. We will discuss how we are using these new insights to design future satellite missions to study air quality.
Author
Air Quality; Atmospheric Composition; Satellite Instruments; Imaging Spectrometers; MODIS (Radiometry); Diurnal Variations; Remote Sensing; Emittance; CloudSat; Boundary Layers

20080030253 NASA Goddard Space Flight Center, Greenbelt, MD, USA
10 Years of Asian Dust Storm Observations from SeaWiFS: Source, Pathway, and Interannual Variability
Hsu, N. Christina; Tsay, S.-C.; King, M.D.; Jeong, M.-J.; August 2008; 1 pp.; In English; International Radiation Symposium (IRS2008), 1-10 Aug. 2008, Foz do Iguacu, Brazil; No Copyright; Avail.: Other Sources; Abstract Only

In this paper, we will demonstrate the capability of a new satellite algorithm to retrieve aerosol optical thickness and single scattering albedo over bright-reflecting surfaces such as urban areas and deserts. Such retrievals have been difficult to perform using previously available algorithms that use wavelengths from the mid-visible to the near IR because they have trouble separating the aerosol signal from the contribution due to the bright surface reflectance. The new algorithm, called Deep Blue, utilizes blue-wavelength measurements from instruments such as SeaWiFS and MODIS to infer the properties of aerosols, since the surface reflectance over land in the blue part of the spectrum is much lower than for longer wavelength channels. We have validated the satellite retrieved aerosol optical thickness with data from AERONET sunphotometers over desert and semi-desert regions. The comparisons show reasonable agreements between these two. These new satellite products will allow scientists to determine quantitatively the aerosol properties near sources using high spatial resolution measurements from SeaWiFS and MODIS-like instruments. The multiyear satellite measurements (1998 - 2007) from SeaWiFS will be utilized to investigate the interannual variability of source, pathway, and dust loading associated with these dust outbreaks in East Asia. The monthly averaged aerosol optical thickness during the springtime from SeaWiFS will also be compared with the MODIS Deep Blue products.
Derived from text
Sea-Viewing Wide Field-of-View Sensor; Dust Storms; Optical Thickness; Aerosols; Albedo; Scattering; Surface Properties; Spatial Resolution; Near Infrared Radiation

46
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*.

20080026259 NASA Johnson Space Center, Houston, TX, USA
Hematite Spherules in Basaltic Tephra Altered Under Aqueous, Acid-Sulfate Conditions on Mauna Kea Volcano, Hawaii: Possible Clues for the Occurrence of Hematite-Rich Spherules in the Burns Formation at Meridiani Planum, Mars
Morris, R. V.; Ming, D. W.; Graff, T. G.; Arvidson, R. E.; Bell, J. F., III; Squyres, S. W.; Mertzman, S. A.; Gruener, J. E.; Golden, D. C.; Robinson, G. A.; Earth and Planetary Science Letters; 30 Nov. 2005; ISSN 0012-821X; Volume 240, Issue 1, pp. 168-178; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 361426.04.05; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.epsl.2005.09.044

Iron-rich spherules (>90% Fe2O3 from electron microprobe analyses) approx.10-100 microns in diameter are found within sulfate-rich rocks formed by aqueous, acid-sulfate alteration of basaltic tephra on Mauna Kea volcano, Hawaii. Although some spherules are nearly pure Fe, most have two concentric compositional zones, with the core having a higher Fe/Al ratio than the rim. Oxide totals less than 100% (93-99%) suggest structural H2O and/or /OH. The transmission Moessbauer spectrum of a spherule-rich separate is dominated by a hematite (alpha-Fe2O3) sextet whose peaks are skewed toward zero velocity. Skewing is consistent with Al(3+) for Fe(3+) substitution and structural H2O and/or /OH. The grey color of the spherules implies specular hematite. Whole-rock powder X-ray diffraction spectra are dominated by peaks from smectite and the hydroxy sulfate mineral natroalunite as alteration products and plagioclase feldspar that was present in the precursor basaltic tephra. Whether spherule formation proceeded directly from basaltic material in one event (dissolution of basaltic material and precipitation of hematite spherules) or whether spherule formation required more than one event (formation of

Fe-bearing sulfate rock and subsequent hydrolysis to hematite) is not currently constrained. By analogy, a formation pathway for the hematite spherules in sulfate-rich outcrops at Meridiani Planum on Mars (the Burns formation) is aqueous alteration of basaltic precursor material under acid-sulfate conditions. Although hydrothermal conditions are present on Mauna Kea, such conditions may not be required for spherule formation on Mars if the time interval for hydrolysis at lower temperatures is sufficiently long.
Author
Hematite; Mars Surface; Spherules; Volcanoes; Iron Oxides; Basalt; Minerals; Sulfates; Water

20080026260 NASA Johnson Space Center, Houston, TX, USA
Magnetite in Martian Meteorite Mil 03346 and Gusev Adirondack Class Basalt: Mossbauer Evidence for Variability in the Oxidation State of Adirondack Lavas
Morris, R. V.; McKay, G. A.; Ming, D. W.; Klingelhoefer, G.; Schroeder, C.; Rodionov, D.; Yen, A.; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Moessbauer spectrometers on the Mars Exploration Rovers Spirit (Gusev crater) and Opportunity (Meridiani Planum) have returned information on the oxidation state of iron, the mineralogical composition of Fe-bearing phases, and the distribution of Fe among oxidation states and phases [1,2,3]. To date, approx.100 and approx.85 surface targets have been analyzed by the Spirit and Opportunity spectrometers, respectively. Twelve component subspectra (8 doublets and 4 sextets) have been identified and most have been assigned to mineralogical compositions [4]. Two sextet subspectra result from the opaque and strongly magnetic mineral magnetite (Fe3O4 for the stoichiometric composition), one each for the crystallographic sites occupied by tetrahedrally-coordinated Fe3+ and by octahedrally-coordinated Fe3+ and Fe2+. At Gusev crater, the percentage of total Fe associated with magnetite for rocks ranges from 0 to approx. 35% (Fig. 1) [3]. The range for soils (approx.5 to approx.12% of total Fe from Mt, with one exception) is narrower. The ubiquitous presence of Mt in soil firmly establishes the phase as the strongly magnetic component in martian soil [4,5].
Author
Magnetite; Basalt; Stoichiometry; Soils; Minerals; Mars Surface; Oxidation; SNC Meteorites

20080026262 NASA Johnson Space Center, Houston, TX, USA
Fe-Bearing Phases Indentified by the Moessbauer Spectrometers on the Mars Exploration Rovers: An Overview
Morris, R. V.; Klingelhoefer, G.; Ming, D. W.; Schroeder, C.; Rodionov, D.; Yen, A.; Gellert, R.; March 13, 2006; 1 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Copyright; Avail.: CASI: A01, Hardcopy

The twin Mars Exploration Rovers Spirit and Opportunity have explored the martian surface at Gusev Crater (GC) and Meridiani Planum (MP), respectively, for about two Earth years. The Moessbauer (MB) spectrometers on both rovers have analyzed an aggregate of approx.200 surface targets and have returned to Earth information on the oxidation state of iron, the mineralogical composition of Fe-bearing phases, and the distribution of Fe among oxidation states and phases at the two landing sites [1-7]. To date, 15 component subspectra (10 doublets and 5 sextets) have been identified and most have been assigned to mineralogical compositions. Two subspectra are assigned to phases (jarosite and goethite) that are marker minerals for aqueous processes because they contain hydroxide anion in their structures. In this paper, we give an overview of the Febearing phases identified and their distributions at Gusev crater and Meridiani Planum.
Derived from text
Iron Oxides; Roving Vehicles; Mars Exploration; Mars Surface; Mineralogy; Oxidation; Landing Sites; Mars Craters

20080026263 NASA Johnson Space Center, Houston, TX, USA
Possible Ni-Rich Mafic-Ultramafic Magmatic Sequence in the Columbia Hills: Evidence from the Spirit Rover
Mittlefehldt, David W.; Gellert, R.; McCoy, T.; McSween, H. Y., Jr.; Li, R.; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Spirit rover landed on geologic units of Hesperian age in Gusev Crater. The Columbia Hills rise above the surrounding plains materials, but orbital images show that the Columbia Hills are older [1, 2]. Spirit has recently descended the southeast slope of the Columbia Hills doing detailed measurements of a series of outcrops. The mineralogical and compositional data on these rocks are consistent with an interpretation as a magmatic sequence becoming increasingly olivine-rich down slope. The outcrop sequence is Larry s Bench, Seminole, Algonquin and Comanche. The ‘teeth’ on the Rock

Abrasion Tool (RAT) wore away prior to arrival at Larry s Bench; the data discussed are for RAT brushed surfaces. Derived from text

Rocks; Magma; Mars Craters; Composition (Property); Olivine; Mineralogy; Mars Landing Sites

20080026264 NASA Johnson Space Center, Houston, TX, USA

Thermal Constraints from Siderophile Trace Elements in Acapulcoite-Lodranite Metals

Herrin, Jason S.; Mittlefehldt, D. W.; Humayun, M.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

A fundamental process in the formation of differentiated bodies is the segregation of metal-sulfide and silicate phases, leading to the formation of a metallic core. The only known direct record of this process is preserved in some primitive achondrites, such as the acapulcoite-lodranites. Meteorites of this clan are the products of thermal metamorphism of a chondritic parent. Most acapulcoites have experienced significant partial melting of the metal-sulfide system but not of silicates, while lodranites have experienced partial melting and melt extraction of both. The clan has experienced a continuum of temperatures relevant to the onset of metal mobility in asteroidal bodies and thus could yield insight into the earliest stages of core formation. Acapulcoite GRA 98028 contains relict chondrules, high modal sulfide/metal, has the lowest 2-pyroxene closure temperature, and represents the least metamorphosed state of the parent body among the samples examined. Comparison of the metal-sulfide component of other clan members to GRA 98028 can give an idea of the effects of metamorphism.

Author

Meteoritic Composition; Extraction; Silicates; Metamorphism (Geology); Chondrule

20080026265 NASA Johnson Space Center, Houston, TX, USA

Evidence for a Single Ureilite Parent Asteroid from a Petrologic Study of Polymict Ureilites

Downes, Hilary; Mittlefehldt, David W.; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080026265

Ureilites are ultramafic achondrites composed of olivine and pyroxene, with minor elemental C, mostly as graphite [1]. The silicate composition indicates loss of a basaltic component through igneous processing, yet the suite is very heterogeneous in O isotopic composition inherited from nebular processes [2]. Because of this, it has not yet been established whether ureilites were derived from a single parent asteroid or from multiple parents. Most researchers tacitly assume a single parent asteroid, but the wide variation in mineral and oxygen isotope compositions could be readily explained by an origin in multiple parent asteroids that had experienced a similar evolution. Numerous ureilite meteorites have been found in Antarctica, among them several that are clearly paired (Fig. 1) and two that are strongly brecciated (EET 83309, EET 87720). We have begun a detailed petrologic study of these latter two samples in order to characterize the range of materials in them. One goal is to attempt to determine whether ureilites were derived from a single parent asteroid.

Author

Achondrites; Ureilites; Mineralogy; Breccia; Asteroids; Basalt

20080026338 NASA Johnson Space Center, Houston, TX, USA

PYTi-NiCr Signatures in the Columbia Hills are Present in Certain Martian Meteorites

Clark, B. C.; Gellert, R.; Ming, D. W.; Morris, R. V.; Mittlefehldt, D. W.; Squyres, S. W.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Uniquely high levels of phosphorus and titanium were observed in several samples [1-3] by the APXS x-ray fluorescence measurements as the MER Spirit rover climbed Husband Hill (Columbia Hills, Gusev crater, Mars). A careful study of many such samples and their geochemical variability has revealed additional elements in this pattern, and that the derived multi-element signature is also unambiguously manifested in several martian meteorites.

Author

SNC Meteorites; Titanium; X Ray Fluorescence; Mars Craters; Geochemistry; Chromium Alloys; Phosphorus

20080026354 NASA Johnson Space Center, Houston, TX, USA

Observation and Analysis of In Situ Carbonaceous Matter in Naklha, Part 2

Gibson, E. K., Jr.; Clemett, S. J.; Thomas-Kerpta, K. L.; McKay, D. S.; Wentworth, S. J.; Robert, F.; Verchovsky, A. B.; Wright, I. P.; Pillinger, C. T.; Rice, T.; VanLeer, B.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The search for indigenous carbon components on Mars has been a challenge. The first attempt was the Viking GC-MS in situ experiment which gave inconclusive results at two sites on Mars [1]. After the discovery that the SNC meteorites were from Mars [2], [3-5] reported C isotopic compositional information which suggested a reduced C component present in the martian meteorites. [6 & 7] reported the presence of reduced C components (i.e., polycyclic aromatic hydrocarbons) associated with the carbonate globules in ALH84001. Jull et al. [8] noted in Nakhla there was an acid insoluble C component present with more than 75% of its C lacking any C-14, which is modern-day carbon. This C fraction was believed to be either indigenous martian or ancient meteoritic carbon. Fisk et al. [9, 10] have shown textural evidence along with C-enriched areas within fractures in Nakhla and ALH84001. To further understand the nature of possible indigenous reduced C components, we have carried out a variety of measurements on martian meteorites. For this presentation we will discuss only the Nakhla results. Interior samples from the Nakhla SNC meteorite, recently made available by the British Museum of Natural History, were analyzed. Petrographic examination [11, McKay et al., this volume] of Nakhla showed evidence of fractures (approx.0.5 micron wide) filled with dark brown to black dendritic material [Fig. 1] with characteristics similar to those observed by [10]. Iddingsite is also present along fractures in olivine. Fracture filling and dendritic material was examined by SEM-EDX, TEM-EDX, Focused Electron Beam microscopy, Laser Raman Spectroscopy, Nano-SIMS Ion Micro-probe, and Stepped-Combustion Static Mass Spectrometry.

Author

Carbonates; Electron Beams; Gas Chromatography; Polycyclic Aromatic Hydrocarbons; Mass Spectroscopy; Igneous Rocks; Scanning Electron Microscopy; Raman Spectroscopy; SNC Meteorites; Petrography

20080029285 NASA Johnson Space Center, Houston, TX, USA

Constraints on the Formation of the Moon from High-Precision ND-Isotopic Measurements of Lunar Basalts

Rankenburg, K.; Brandon, A. D.; Neal, C. R.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The most widely accepted theory for the formation of the Earth-Moon system proposes a giant impact model, where Earth collided in its later stages of accretion with a body of the approximate size of Mars [1, 2]. In this model, the Moon ultimately formed from hot debris generated during this giant impact. Short-lived radioisotopes such as Sm-146 (t(sub 1/2) = 103 Ma) may be useful in determining the chronology of the events that formed the Earth-Moon system and for how these terrestrial bodies evolved following accretion. New high-precision samarium-neodymium data showed that chondritic meteorites are on average 20 ppm lower in 142Nd/144Nd than terrestrial samples [3]. These data suggest that if the bulk silicate Earth (BSE) has a Sm/Nd ratio within the range measured for chondrites, the higher-than-chondritic Nd-142/Nd-144 ratio of terrestrial materials requires that the silicate Earth experienced a global chemical differentiation during the lifetime of Sm-146. If the Moon has super-chondritic Nd-142/Nd-144 identical to the Earth, as suggested by available data [4], then the giant impact must have occurred into an already differentiated Earth, predominantly sampling the Nd-depleted reservoir. In order to test this hypothesis, high-precision Nd-isotope ratios were obtained on a Thermo-Finnigan Triton TIMS for six lunar basalts that span the compositional range of lavas from the Moon: Samples 15555 and LAP 02205 represent low-Ti basalts; 70017 and 74275 are high-Ti basalts; 15386 and SAU 169 are KREEP basalts.

Author

Earth-Moon System; Basalt; Radioactive Isotopes; Chronology; Samarium Isotopes; Silicates; Isotope Ratios; Moon

20080029368 NASA Johnson Space Center, Houston, TX, USA

Sulfur in Earth's Mantle and Its Behavior During Core Formation

Chabot, Nancy L.; Righter,Kevin; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains black and white illustrations

Contract(s)/Grant(s): NNG05GN04G; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080029368

The density of Earth's outer core requires that about 5-10% of the outer core be composed of elements lighter than Fe-Ni; proposed choices for the 'light element' component of Earth's core include H, C, O, Si, S, and combinations of these elements [e.g. 1]. Though samples of Earth's core are not available, mantle samples contain elemental signatures left behind from the

formation of Earth's core. The abundances of siderophile (metal-loving) elements in Earth's mantle have been used to gain insight into the early accretion and differentiation history of Earth, the process by which the core and mantle formed, and the composition of the core [e.g. 2-4]. Similarly, the abundance of potential light elements in Earth's mantle could also provide constraints on Earth's evolution and core composition. The S abundance in Earth's mantle is 250 (50) ppm [5]. It has been suggested that 250 ppm S is too high to be due to equilibrium core formation in a high pressure, high temperature magma ocean on early Earth and that the addition of S to the mantle from the subsequent accretion of a late veneer is consequently required [6]. However, this earlier work of Li and Agee [6] did not parameterize the metalsilicate partitioning behavior of S as a function of thermodynamic variables, limiting the different pressure and temperature conditions during core formation that could be explored. Here, the question of explaining the mantle abundance of S is revisited, through parameterizing existing metal-silicate partitioning data for S and applying the parameterization to core formation in Earth.
Author
Earth Core; High Pressure; Thermodynamics; Silicates; High Temperature; Earth Mantle; Magma

20080029991 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Goddard Multi-Scale Modeling System with Unified Physics
Tao, Wei-Kuo; June 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

A multi-scale modeling system with unified physics has been developed at NASA Goddard Space Flight Center (GSFC). The system consists of an MMF, the coupled NASA Goddard finite-volume GCM (fvGCM) and Goddard Cumulus Ensemble model (GCE, a CRM); the state-of-the-art Weather Research and Forecasting model (WRF) and the stand alone GCE. These models can share the same microphysical schemes, radiation (including explicitly calculated cloud optical properties), and surface models that have been developed, improved and tested for different environments. The following is presented in this report: (1) a brief review of the GCE model and its applications on the impact of aerosols on deep precipitation processes, (2) the Goddard MMF and the major difference between two existing MMFs (CSU MMF and Goddard MMF), and preliminary results (the comparison with traditional GCMs), and (3) a discussion on the Goddard WRF version (its developments and applications).
Author (revised)
Atmospheric Physics; Atmospheric Models; Weather Forecasting

20080030169 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA; NASA Johnson Space Center, Houston, TX, USA
Moessbauer Mineralogy of Rock, Soil, and Dust at Gusev Crater, Mars: Spirit's Journey through Weakly Altered Olivine Basalt on the Plains and Pervasively Altered Basalt in the Columbia Hills
Morris, R. V.; Klingelhoefer, G.; Schroeder, C.; Rodionov, D. S.; Yen, A.; Ming, D. W.; deSouza, P. A., Jr.; Fleischer, I.; Wdowiak, T.; Gellert, R.; Bernhardt, B.; Evlanov, E. N.; Zubkov, B.; Foh, J.; Bonnes, U.; Kankeleit, E.; Guetlich, P.; Renz, F.; Squyres, S. W.; Arvidson, R. E.; [2006]; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): GSA 50QM 99022; CAPES PASJ 142/1999; 361425.94.95; Copyright; Avail.: CASI: A05, Hardcopy

The Moessbauer spectrometer on Spirit measured the oxidation state of Fe, identified Fe-bearing phases, and measured relative abundances of Fe among those phases for surface materials on the plains and in the Columbia Hills of Gusev crater. Eight Fe-bearing phases were identified: olivine, pyroxene, ilmenite, magnetite, nanophase ferric oxide (npOx), hematite, goethite, and a Fe(3+)-sulfate. Adirondack basaltic rocks on the plains are nearly unaltered (Fe(3+)/Fe(sub T)<0.2) with Fe from olivine, pyroxene (Ol>Px), and minor npOx and magnetite. Columbia Hills basaltic rocks are nearly unaltered (Peace and Backstay), moderately altered (WoolyPatch, Wishstone, and Keystone), and pervasively altered (e.g., Clovis, Uchben, Watchtower, Keel, and Paros with Fe(3+)/Fe(sub T) approx.0.6-0.9). Fe from pyroxene is greater than Fe from olivine (Ol sometimes absent), and Fe(2+) from Ol+Px is 40-49% and 9-24% for moderately and pervasively altered materials, respectively. Ilmenite (Fe from Ilm approx.3-6%) is present in Backstay, Wishstone, Keystone, and related rocks along with magnetite (Fe from Mt approx. 10-15%). Remaining Fe is present as npOx, hematite, and goethite in variable proportions. Clovis has the highest goethite content (Fe from Gt=40%). Goethite (alpha-FeOOH) is mineralogical evidence for aqueous processes because it has structural hydroxide and is formed under aqueous conditions. Relatively unaltered basaltic soils (Fe(3+)/Fe(sub T) approx. 0.3) occur throughout Gusev crater (approx. 60-80% Fe from Ol+Px, approx. 10-30% from npOx, and approx. 10% from Mt). PasoRobles soil in the Columbia Hills has a unique occurrence of high concentrations of Fe(3+)-sulfate (approx. 65% of Fe). Magnetite is identified as a strongly magnetic phase in Martian soil and dust.
Author
Mineralogy; Rocks; Iron Oxides; Hematite; Magnetite; Mars Craters; Surface Properties; Mars Surface

20080030218 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Measurement of Atmospheric Composition from Geostationary Platforms

Bhartia, P. K.; Kawa, S. R.; Janz, S.; Herman, J. R.; Gleason, J. F.; June 29, 2008; 1 pp.; In English; Quadrennial Ozone Symposium 2008/International Ozone Commission and European Commission, 29 Jun. - 5 Jul. 2008, Tromso, Norway; No Copyright; Avail.: Other Sources; Abstract Only

Satellite instruments flown since 1970 have had great success in elucidating the processes that control stratospheric ozone. In contrast, space-based data for tropospheric constituents that affect air quality and climate have only recently become available. While these datasets highlight the rapidly advancing capabilities of spacebased tropospheric sensors, they are also pointing to the limitations of sun-synchronous, low-earth orbiting (SSO/LEO) satellite platforms for making such measurements. In our talk we will highlight the science requirements for new missions and the technological and algorithmic approaches that we are developing to meet these requirements. From these studies a clear need for advanced atmospheric composition sensors has emerged that can be put on geostationary (GEO) platforms to provide 5 km horizontal resolution with 15-60 minutes repeat cycle. Such measurements have been high priority in the recently released Decadal Survey report by the US National Research Council. The need for GEO is driven not only by the science requirements to track rapidly changing pollution events but also by the need to provide altitude-resolved information about tropospheric constituents. Currently, with the exception of aerosols, it is not possible to derive profile information about lower tropospheric constituents from satellite measurements. New algorithmic approaches are being developed to obtain this information by combining UV and IR data, by monitoring the spatial and temporal structures of the constituents, and by using low-level clouds to separate boundary layer constituents from free troposphere. All these approaches require better spatial and temporal resolution than that provided by LEO sensors.

Author

Atmospheric Sounding; Atmospheric Composition; Sensors; Synchronous Platforms

20080030245 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Assimilation of Aura Ozone Data and Comparisons with In Situ Observations

Stajner, Ivanka; Wargan, Krzysztof; Pawson, Steven; December 28, 2008; 1 pp.; In English; SHADOX Special Session of the Fall 2007 AGU Meeting, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Ozone data from the Ozone Monitoring Instrument (OMI) and the Microwave Limb Sounder (MLS) onboard EOS Aura satellite were assimilated into the Goddard Earth Observing System Version 4 (GEOS-4) ozone assimilation system. Comparison of assimilated ozone with ozone sonde and MOZAIC data indicate an agreement within 10% in the lower stratosphere, where dynamical processes dominate. Assimilation of OMI and MLS data improves tropospheric column estimates in the Atlantic region, but leads to an overestimation in the tropical Pacific in comparison with SHADOZ sondes. Transport and data biases are considered in order to understand these discrepancies. Comparisons of assimilated tropospheric ozone columns with ozone sonde data reveal root-mean-square (RMS) differences of 2.9 to 7.2 DU, which are typically smaller than the model-sonde RMS differences. Four different definitions of the tropopause using temperature lapse rate, potential vorticity (PV) and isentropic surfaces or ozone isosurfaces are compared with respect to their global impact on the estimated tropospheric ozone column. The largest sensitivity in the tropospheric ozone column is found near the subtropical jet, where the ozone or PV determined tropopause typically lies below the lapse rate tropopause.

Author

Ozone; Aura Spacecraft; Microwave Sounding; Spacecraft Instruments; Data Integration; In Situ Measurement; Ozonesondes

20080030260 NASA Johnson Space Center, Houston, TX, USA

Derivation of Apollo 14 High-Al Basalts from Distinct Source Regions at Discrete Times: New Constraints

Neal, C. R.; Shih, C.-Y.; Reese, Y.; Nyquist, L. E.; Kramer, G. Y.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Apollo 14 basalts occur predominantly as clasts in breccias, but represent the oldest volcanic products that were returned from the Moon [1]. These basalts are relatively enriched in Al2O3 (11-16 wt%) compared to other mare basalts (7-11 wt%) and were originally classified into 5 compositional groups [2,3]. Neal et al. [4] proposed that a continuum of compositions existed. These were related through assimilation (of KREEP) and fractional crystallization (AFC). Age data, however, show that at least three volcanic episodes are recorded in the sample collection [1,5,6]. Recent work has demonstrated that there are three, possibly four groups of basalts in the Apollo 14 sample collection that were erupted from different source regions at different times [7]. This conclusion was based upon incompatible trace element (ITE) ratios of elements that should not be

fractionated from one another during partial melting (Fig. 1). These groups are defined as Group A (Groups 4 & 5 of [3]), Group B (Groups 1 & 2 of [3]), and Group C (Group 3 of [3]). Basalt 14072 is distinct from Groups A-C.
Author
Basalt; Aluminum Oxides; Trace Elements; Breccia; Crystallization; Continuums

20080030278 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Relationship of Loss, Mean Age of Air and the Distribution of CFC's to Stratospheric Circulation and Implications for Atmospheric Lifetimes
Douglas, A. R.; Stolarski, R. S.; Schoeberl, M. R.; Jackman, C. H.; Gupta, M. L.; Newman, P. A.; Nielsen, J. E.; Fleming, E. L.; June 29, 2008; 1 pp.; In English; Quadrennial Ozone Symposium, 29 Jun. - 6 Jul. 2008, Tromso, Norway; No Copyright; Avail.: Other Sources; Abstract Only

Model-derived estimates of the annually integrated destruction and lifetime for various ozone depleting substances (ODSs) depend on the simulated stratospheric transport and mixing in the global model used to produce the estimate. Observations in the middle and high latitude lower stratosphere show that the mean age of an air parcel (i.e., the time since its stratospheric entry) is related to the fractional release for the ODs (i.e., the amount of the ODS that has been destroyed relative to the amount at the time of stratospheric entry). We use back trajectory calculations to produce an age spectrum, and explain the relationship between the mean age and the fractional release by showing that older elements in the age spectrum have experienced higher altitudes and greater ODs destruction than younger elements. In our study, models with faster circulations produce distributions for the age-of-air that are 'young' compared to a distribution derived from observations. These models also fail to reproduce the observed relationship between the mean age of air and the fractional release. Models with slower circulations produce both realistic distributions for mean age and a realistic relationship between mean age and fractional release. These models also produce a CFCl3 lifetime of approximately 56 years, longer than the 45 year lifetime used to project future mixing ratios. We find that the use of flux boundary conditions in assessment models would have several advantages, including consistency between ODS evolution and simulated loss even if the simulated residual circulation changes due to climate change.
Author
Chlorofluorocarbons; Atmospheric Circulation; Atmospheric Chemistry; Ozone Depletion

20080030280 NASA Goddard Space Flight Center, Greenbelt, MD, USA
What Might We Learn About Magnetospheric Substorms at the Earth from the MESSENGER Measurements at Mercury?
Slavin, James A.; May 2008; 1 pp.; In English; International Conference on Substorms, 1-9 May 2008, Graz, Austria; No Copyright; Avail.: Other Sources; Abstract Only

Satellite observations at the Earth, supported by theory and modeling, have established a close connection between the episodes of intense magnetospheric convection termed substorms and the occurrence of magnetic reconnection. Magnetic reconnection at the dayside magnetopause results in strong energy input to the magnetosphere. This energy can either be stored or used immediately to power the magnetospheric convection that produces the phenomena that collectively define the 'substorm.' However, many aspects of magnetic reconnection and the dynamic response of the coupled solar wind - magnetosphere - ionosphere system at the Earth during substorms remain poorly understood. For example, the rate of magnetic reconnection is thought to be proportional to the local Alfven speed, but the limited range of changes in this solar wind parameter at 1 AU have made it difficult to detect its influence over energy input to the Earth's magnetosphere. In addition, the electrical conductance of the ionosphere and how it changes in response to auroral charged particle precipitation are hypothesized to play a critical role in the development of substorms, but the nature of this electrodynamic interaction remain difficult to deduce from Earth observations alone. The amount of energy the terrestrial magnetosphere can store in its tail, the duration of the storage, and the trigger(s) for its dissipation are all thought to be determined by not only the microphysics of the cross-tail current layer, but also the properties of the coupled magnetosphere - ionosphere system. Again, the separation of microphysics effects from system response has proved very difficult using measurements taken only at the Earth. If MESSENGER'S charged particle and magnetic field measurements confirm the occurrence of terrestrial-style substorms in Mercury's miniature magnetosphere, then it may be possible to determine how magnetospheric convection, field-aligned currents, charged particle acceleration, reconnection, and tail energy storage are influenced by the intense magnetic reconnection expected to be associated with solar wind conditions at 0.3 - 0.5 AU from the Sun and the simplified electrodynamic feed-back anticipated for a planet lacking an ionosphere. MESSENGER observations from its 14 January 2008

Mercury flyby relevant to the occurrence of magnetic reconnection and substorms at Mercury will be discussed.
Author
Earth Magnetosphere; Magnetic Storms; Messenger (Spacecraft); Satellite Observation; Mercury (Planet); Charged Particles; Magnetic Fields; Planetary Magnetospheres

20080030359 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Regional Similarity of Leveed Lava Flows on the Mars Plains
Baloga, Steve M.; Glaze, Lori, S.; March 10, 2008; 2 pp.; In English; Lunar and Planetary Science Conference, 10-14 Mar. 2008, Houston, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The dynamics of lava flow movement are controlled by the fluid interior. Crust, solids, and nondeformable material can only retard the advance or spreading of a lava flow. Figure 1 shows a typical large, channelized lava flow found on the Mars plains. It has been suggested in [I] that such large leveed flows on the Mars plains were emplaced by a balance between the formation and shedding of crust as the flow advances. For the prototypical flow north of Pavonis Mons (Fig. I), such a balance leads to a flow morphology that approximately self-replicates at all locations along the flow path [2,3]. Moreover, most quantitative characteristics of emplacement (e.g., viscosity, volumetric flow rate) of the prototype flow at Pavonis Mons resembled those of large channelized lava flows on Earth. The exception was the relatively long, sustained supply of lava, on the order of a year as opposed to hours or days for terrestrial analogs.
Derived from text
Lava; Mars Surface; Mars Volcanoes; Planetary Geology; Fluid Flow; Crusts; Channel Flow

20080030435 Washington Univ., Seattle, WA USA
Factors Influencing the Mesoscale Variations in Marine Stratocumulus Albedo
Hegg, D A; Nielsen, K; Covert, D S; Jonsson, H H; Durkee, P A; Jan 2007; 12 pp.; In English
Contract(s)/Grant(s): N00014-97-1-0132
Report No.(s): AD-A479811; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479811

Measurements of both horizontal gradients and vertical profiles of aerosols, cloud droplets and thermodynamic parameters in the cloud topped marine boundary layer off of central California are presented. They suggest that, while aerosols can indeed modulate cloud albedo, other parameters such as sea surface temperature may similarly affect cloud albedo. Additionally, the impact of aerosols, through sedimentation and precipitation, on cloud optical depths and thus albedo is not always in accord with conventional expectations and can either enhance or decrease the albedo, depending on ambient conditions. Taken together, these results suggest that current estimates of indirect forcing by aerosols could be significantly in error.
DTIC
Aerosols; Air Water Interactions; Albedo; Atmospheric Boundary Layer; Boundary Layers; Marine Meteorology; Mesoscale Phenomena; Sediments; Stratocumulus Clouds; Thermodynamics

20080030606 Defence Research and Development Canada, Toronto, Ontario Canada
Characterization of Atmospheric Emissions Produced by Live Gun Firing: Test on the Carl Gustav Anti-Tank, 84 mm Weapon
Quemerais, Bernadette; Diaz, Emmanuela; Poulin, Isabelle; Marois, Andre; Mar 2008; 44 pp.; In English
Report No.(s): AD-A480051; DRDC-TORONTO-TR-2007-103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Airborne substances emitted during live gun firing of the anti-tank Carl Gustav 84 mm weapon were characterized during a live firing training exercise in Canadian Forces Base (CFB) Valcartier in February 2007. Sampling was performed continuously for two hours throughout the exercise during which particles and chemicals accumulated on sampling media. In total, seventyone rounds were fired at two firing bays. Established occupational health methods were used to collect and analyze samples for particulate matter, hydrogen cyanide, polycyclic aromatic hydrocarbons (PAHs), dinitrotoluene compounds, benzene, toluene, ethylbenzene and xylene, metals, aldehydes, nitric acid (HNO3), nitric oxide (NO), nitrogen dioxide (NO2), hydrogen sulphide (H2S) and sulphur dioxide (SO2). Two sets of samples were collected at two sampling stations. Both sampling stations were located behind Firing Bay #2. Most of the chemicals were not detected during the trial. For both sets of samples, particles were found at concentrations much higher than the recommended environmental standards. These findings suggest that there is a potential risk to health associated with exposure to particles for artillery soldiers. For contaminants, concentrations were detected at higher levels at Station #1 than at Station #2 since the first station was closer

to the firing bay. Hydrogen cyanide was detected at concentrations of 26.7 and 21.7 g/m3 for Stations #1 and #2, respectively. Lead was detected at concentrations of 2.8 and 2.1 g/m3 for Stations #1 and #2, respectively. Acetaldehyde was detected at concentrations of 12.7 and 9.3 g/m3, respectively, and formaldehyde was also detected at concentrations of 8.2 and 5.8 g/m3 for Stations #1 and #2, respectively. Although iron and propionaldehyde were also detected, it is believed that the concentrations observed were too low to create a potential risk for the soldiers.
DTIC
Airglow; Atmospheric Physics; Gunfire

20080030630 Naval Postgraduate School, Monterey, CA USA
Probabilistic Stability of an Atmospheric Model to Various Amplitude Perturbations
Chu, Peter C; Ivanov, Leonid M; Margolina, Tatyana M; Melnichenko, Oleg V; Oct 1, 2002; 15 pp.; In English
Report No.(s): AD-A480140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Every forecast should include an estimate of its likely accuracy, as a measure of predictability. A new measure, the first passage time (FPT), which is defined as the time period when the model error first exceeds a predetermined criterion (i.e. the tolerance level), is proposed here to estimate model predictability. A theoretical framework is developed to determine the mean and variance of FPT. The low-order Lorenz atmospheric model is taken as an example to show the robustness of using FPT as a quantitative measure for prediction skill. Both linear and nonlinear perspectives of forecast errors are analytically investigated using the self-consistent Nicolis model. The mean and variance of FPT largely depends on the ratio between twice the maximum Lyapunov exponent (sigma) and the intensity of attractor fluctuations (q sq), lambda = 2(sigma)/q sq. Two types of predictability are found: lambda > 1 referring to low predictability and lambda < 1 referring to high predictability. The mean and variance of FPT can be represented by the e-folding timescales in the low-predictability range, but not in the high-predictability range. The transition between the two predictability ranges is caused by the variability of the attractor characteristics along the reference trajectory.
DTIC
Accuracy; Atmospheric Models; Perturbation; Predictions; Stability

20080030643 Naval Postgraduate School, Monterey, CA USA
Air-Ice-Ocean Feedback Mechanisms and Ice Oscillation on Millennial Time Scales
Chu, P C; Jan 1990; 5 pp.; In English
Report No.(s): AD-A480185; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Air-ice-ocean feedback mechanisms, which are not conventionally incorporated within either climate or glacial models, are investigated to illustrate their potential role in generating ice advance/retreat on the time scale of 10(3) - 10(4) years; i.e. for examining the internal causes for the ice oscillation. Three main feedback loops are found from a coupled air-ice-ocean model developed in this paper; (a) ice advance - lower air temperature - ice freezing - ice advance; and (b) ice advance - higher ocean temperature - ice melting - ice retreat; (c) ice advance/retreat - modification of evaporation rate - change of ice accumulation rate and sea-level height - ice advance/retreat. The relative strength of the three feedback mechanisms determines the characteristics of the modes; growing or decaying, oscillatory or nonoscillatory. The solutions show the generation of growing oscillatory modes with the time scale of 10(3) - 10(4) years in certain parameter ranges.
DTIC
Air; Air Sea Ice Interactions; Feedback; Glaciers; Ice; Oceans; Oscillations

20080030646 Naval Postgraduate School, Monterey, CA USA
Generation of Low-Frequency Unstable Modes in a Coupled Equatorial Troposphere and Ocean Mixed-Layer Model
Chu, P C; May 1992; 20 pp.; In English
Report No.(s): AD-A480191; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An important issue presented here is the existence of two different types of correlation between time rate of change of sea surface temperature (SST) partial derivative Tau/partial derivative tau and the ocean mixed-layer (OML) depth h(omega), depending on the ocean surface conditions. In the tropics, the net heat flux (including radiation budget) at the ocean surface is generally downward and dampens the OML turbulent kinetic energy (TKE). As the ocean surface is under weak wind forcing, the OML shallows to the Monin-Obukhov length scale due to insufficient wind-generated TKE to entrain the deep cool water into the OML. Net heat gain at the ocean surface and very little heat loss at the OML base leads to a warming OML. The thinner the OML, the warmer the OML. Therefore, partial derivative Tau/partial tau and h(omega) are negatively correlated; however, as the ocean surface is under strong wind forcing, the OML deepens due to sufficient wind-generated TKE

to entrain the deep cool water into OML. The excessive heat loss at the OML base (entrainment heat flux) over net heat gain at the ocean surface leads to a cooling OML. The thicker the OML, the warmer the OML. Therefore, partial derivative Tau/partial derivative tau and h(omega) are positively correlated. The shift of positive-only correlation between partial derivative Tau/partial derivative tau and h(omega) (as conventionally thought to be), to two-way correlation leads to a new theory about the interannual tropical ocean-atmosphere interaction. To investigate the impact of this new idea on the interannual tropical ocean-atmosphere interaction, an Air- Ocean Surface Heat Exchange (AOSHE) Model, which is a coupled system consisting of the Wind-Induced Surface Heat Exchange (WISHE) Model (Yano and Emanuel) and the Ocean Mixed-Layer (OML) Model (Chu and Garwood) has been developed. The major advantage of the AOSHE model is simple but contains realistic thermodynamics in both ocean and atmosphere.
DTIC
Low Frequencies; Ocean Models; Ocean Surface; Surface Temperature; Tropical Regions; Troposphere

20080030658 Scripps Institution of Oceanography, La Jolla, CA USA
Passive Imaging System for Measuring Atmospheric Scattering
Shields, Janet; Jan 2008; 4 pp.; In English
Contract(s)/Grant(s): N00014-07-1-1060
Report No.(s): AD-A480264; No Copyright; Avail.: Defense Technical Information Center (DTIC)
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 November 2007 and 31 January 2008.
DTIC
Atmospheric Scattering; Imaging Techniques; Line of Sight; Measuring Instruments

20080030961 NASA Johnson Space Center, Houston, TX, USA; NASA Johnson Space Center, Houston, TX, USA
Heavy Isotope Composition of Oxygen in Zircon from Soil Sample 14163: Lunar Perspective of an Early Ocean on the Earth
Nemchin, A. A.; Whitehouse, M. J.; Pidgeon, R. T.; Meyer, C.; March 13, 2006; 2 pp.; In English; Lunar Planetary Science XXXVII, 13-17 Mar. 2006, SouthShore Habour, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy
Thirty oxygen analyses of a large (sub-millimetre) zircon grain from the lunar soil sample 14163 have been determined using CAMECA 1270 ion microprobe. The sample 14163 was returned form the Fra Mauro region by Apollo 14 mission. Zircon grain of 0.6-0.8 mm in size extracted from the sample was imaged using CL detector fitted to the Philips Electron Microscope in order to reveal internal structure. Oxygen isotopes have been analysed during two sessions. The first set of data was collected using the original mount where the grain was set in the resin attached to the glass slide. This resulted in the two complications: (i) standard zircon has to be analysed from the separate mount and (ii) the lunar zircon grain was rased in the holder compared to the standard. In order to investigate, if the elevated oxygen compositions observed during this session could have resulted from this difference in geometric configuration during the standard and sample analyses, the lunar zircon was extracted from the original mount, remounted with the standard chip in the new resin disk and reanalysed during the second session. All analyses made during the first session show delta O-18 values heavier than 6.0%. The second set of data has a wider spread of delta O-18 values with some values as low as 5.6%. Nevertheless, a half of observed delta O-18 values in this set is also higher than 6.0%. Slightly lighter oxygen compositions observed during the second session indicate possible dependence of measured delta O-18 values on the geometry of analysed samples. Presence of zircons with similar heavy oxygen isotope compositions on the Moon, which neither had liquid water or felic crust similar to that on the Earth nor ever developed regime similar to plate tectonics, suggests that other mechanisms can be responsible for elevated delta O-18 values in zircons. This implies that there is no support for the presence of an ocean on the surface of the early Earth and as the ocean appears to be an essential ingredient for the plate tectonics, there is no basis for belief that this mechanism was operating in the early history of the planet.
Derived from text
Oxygen Isotopes; Heavy Ions; Zirconium; Oceans; Earth Surface

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080026310 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Empirical Studies on Traffic Flow in Inclement Weather. Final Report - Phase I
Rakha, H.; Farzaneh, M.; Arafeh, M.; Hranac, R.; Sterzin, E.; Jun. 2007; 108 pp.; In English
Report No.(s): PB2007-109646; No Copyright; Avail.: National Technical Information Service (NTIS)

Weather causes a variety of impacts on the transportation system. While severe winter storms, hurricanes, or flooding can result in major stoppages or evacuations of transportation systems and cost millions of dollars, day-to-day weather events such as rain, fog, snow, and freezing rain can have a serious impact on the mobility and safety of the transportation system users. These weather events can result in increased fuel consumption, delay, number of accidents, and significantly impact the performance of the transportation system. The overall goal of the research work undertaken in this study was to develop a better understanding of the impacts of weather on traffic flow. The research was intended to accomplish the following specific objectives: (1) Study the impact of precipitation on macroscopic traffic flow parameters over a full range of traffic states; (2) Study the impact of precipitation on macroscopic traffic flow parameters using consistent, continuous weather variables; (3) Study the impact of precipitation on macroscopic traffic flow parameters on a wide range of facilities; (4) Study regional differences in reaction to precipitation; and (5) Study macroscopic impacts of reduced visibility.
NTIS
Traffic; Storms (Meteorology); Rain; Fog; Snow

20080029308 National Centers for Environmental Prediction, Silver Spring, MD USA
National Weather Service Observing Handbook No. 1: Marine Surface Weather Operations
Jul. 2004; 159 pp.; In English
Report No.(s): PB2007-113179; No Copyright; Avail.: National Technical Information Service (NTIS)

In writing this new edition of NWS Observing Handbook No. 1, it has been our intent to include as much useful information as possible in the available space. The compact size and design, and field guide format, should allow for easy handling and quick reference. We hope this simplifies your work as weather observers, and makes it easier to locate the information you need. Weather has an almost magical hold on the mariner. Every change in the weather at sea is noted with a sense of trepidation. Reporting weather not only contributes to your safety, but adds to your basic knowledge of seamanship. It is part of keeping a good lookout. For every 100 observations on land, there is only about 1 observation at sea. Without your participation in the Voluntary Observing Ship (VOS) program, there would be vast marine areas without data, making weather forecasting nearly impossible for these areas. The importance of ship reports cannot be overstated. We thank ships officers for their fine work, dedication, and committment. Please follow the weather reporting schedule for ships as best you can (0000, 0600, 1200, 1800 UTC from all areas; every 3-hours from the Great Lakes, from within 200 miles of the USA and Canadian coastlines, and from within 300 miles of named tropical storms or hurricanes). For assistance, contact a Port Meteorological Officer (PMO), who will come aboard your vessel and provide all the information you need to observe, code, and transmit weather.
NTIS
Handbooks; Marine Meteorology; Seas; Weather

20080029322 Naval Postgraduate School, Monterey, CA USA
First Passage Time Analysis on Climate Indices
Chu, Peter C; Jan 2008; 31 pp.; In English
Report No.(s): AD-A478896; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA478896

Climate variability is simply represented by teleconnection patterns such as the Arctic Oscillation (AO), Antarctic Oscillation (AAO), North Atlantic Oscillation (NAO), Pacific/North American Pattern (PNA), and Southern Oscillation (SO) with associated indices Two approaches can be used to predict the indices: forward and backward methods The forward method is commonly used to predict the index fluctuation p at time t with a given temporal increment t Using this method% it was found that the index (such as for NAO) has the Brownian fluctuations On the base of the first passage time (FPT) concept, the backward method is introduced in this study to predict the typical time span (t) needed to generate a fluctuation in the index of a given increment p After the five monthly indices (AO, AAO, NAO, PNA, SO) running through the past

history, the FPT density functions are obtained. FPT presents a new way to detect the temporal variability of the climate indices. The basic features for the index prediction are also discussed.
DTIC
Climate; Time Series Analysis

20080029332 National Centers for Environmental Prediction, Silver Spring, MD USA
Hurricane Wilma Post Storm Data Acquisition Estimated Peak Wind Analysis and Storm Tide Data
Dec. 27, 2005; 9 pp.; In English
Report No.(s): PB2007-113180; No Copyright; Avail.: National Technical Information Service (NTIS)

Hurricane Wilma was the sixth major hurricane of the record-breaking 2005 Atlantic hurricane season. It was also the third Category 5 hurricane of the season, eclipsing the records set in 1960 and 1961. Wilma was the third Category 5 hurricane to develop in October, the other two being Hurricane Mitch of 1998, and Hurricane Hattie of 1961.
NTIS
Data Acquisition; Estimating; Hurricanes; Storms; Tides; Wind Measurement

20080029348 National Centers for Environmental Prediction, Silver Spring, MD USA
Post Storm Data Acquisition: Hurricane Rita. Peak Wind Gust Analysis and Storm Surge Data
Nov. 14, 2005; 7 pp.; In English
Report No.(s): PB2007-113181; No Copyright; Avail.: National Technical Information Service (NTIS)

Hurricane Rita was the second Category 5 hurricane of the 2005 Atlantic hurricane season. Ritas minimum central pressure dropped to 897 millibars (mb) on September 21, 2005, making it the strongest hurricane ever observed in the Gulf of Mexico. Rita was the third most intense hurricane ever in the Atlantic Basin behind Hurricane Gilbert in 1988 and the 1935 Labor Day Hurricane (Note: Hurricane Wilma became the strongest hurricane ever observed in the Gulf of Mexico and Atlantic Basin on October 19, 2005, moving Rita to second and fourth respectively). Ritas maximum sustained winds peaked near 175 mph. It weakened to a category 2 hurricane with maximum sustained winds of 100 mph before making landfall between Sabine Pass, Texas, and Johnson's Bayou, Louisiana, at 02:38 CDT (07:38 UTC) on September 24, 2005.
NTIS
Gusts; Hurricanes; Storms

20080029349 National Centers for Environmental Prediction, Silver Spring, MD USA
Post Storm Data Acquisition: Aerial Wind Mapping Mission, Hurricane Charley, 2004
Oct. 25, 2004; 7 pp.; In English
Report No.(s): PB2007-113182; No Copyright; Avail.: National Technical Information Service (NTIS)

On August 13th, 2004, a rapidly strengthening Hurricane Charley moved ashore in the USA on the southwest Florida coast. In the five hours prior to the late afternoon landfall, the central atmospheric pressure of the tropical cyclone decreased from 965 millibars (MB) / 28.49 inches of mercury to 941 MB / 27.79 inches of mercury. Landfall occurred at 3:35 pm EDT on the barrier islands of Lee County Florida. Charley produced a 10 to 15 mile wide swath of winds gusting in excess of 100 miles per hour (MPH) as it moved ashore from the Captiva area inland toward Punta Gorda, Port Charlotte, and Arcadia. Winds gusting to hurricane force continued near the core of the cyclone during its trek across the Florida peninsula. Two Post Storm Data Acquisition (PSDA) aerial wind mapping missions were conducted by the National Weather Service (NWS) in the areas affected by Charley. One on August 15th and 16th, the other on August 29th. The following summarizes both missions.
NTIS
Aerial Photography; Cyclones; Hurricanes; Photomapping; Storms

20080029350 National Centers for Environmental Prediction, Silver Spring, MD USA
Post Storm Data Acquisition: Aerial Wind Mapping Mission, Hurricane Jeanne
Oct. 18, 2004; 8 pp.; In English
Report No.(s): PB2007-113183; No Copyright; Avail.: National Technical Information Service (NTIS)

Hurricane Jeanne was born as a tropical depression over the northern Caribbean islands on September 13, 2004. The depression became a tropical storm as it moved across Puerto Rico on September 15th. The storm continued to move slowly westward along the northern coast of the Dominican Republic and Haiti. The tropical cyclone weakened considerably but eventually emerged over the warm Atlantic waters once again. Jeanne then slowly intensified again as it made a loop over the western Atlantic before moving westward through the northern Bahamas. Hurricane Jeanne made landfall on the southeast

Florida coast, near Stuart, during the late evening of September 25, 2004. The hurricane was a category three storm on the Saffir-Simpson Scale when it made landfall. Hurricane Jeanne was a relatively large storm and had a well defined 25+ mile wide eye at landfall. The most significant damage associated with the hurricane was confined to the eyewall where several instances of deep convection resulted in enhanced surface winds. Most of the central Florida peninsula experienced hurricane force wind gusts. Nearly the entire state had wind gusts to at least tropical storm force. Hurricane Jeanne was the fourth hurricane to impact Florida since the middle of August 2004. Figure 1 shows the tracks of the hurricanes across the Florida peninsula. Hurricane Jeanne made landfall on September 25th very close to where hurricane Frances made landfall just three weeks earlier. A Post Storm Data Acquisition (PSDA) Aerial Wind Mapping Mission was flown by NOAA's National Weather Service (NWS) on September 29, 2004 to investigate the area of maximum wind damage. Analysis of photographs and video taken during the mission were integrated with subsequent ground surveys and additional information received from the Florida NWS Weather Forecast Offices (WFOs) in Melbourne, Miami, Tampa, Tallahassee, and Jacksonville to produce a final peak gust analysis map.
NTIS
Aerial Photography; Hurricanes; Photomapping; Storms

20080030132 Environmental Protection Agency, Washington, DC, USA
Climate Change and Interacting Stressors: Implications for Coral Reef Management in American Samoa
Jun. 2007; 72 pp.; In English
Report No.(s): PB2007-113085; EPA/600/R-07/069; No Copyright; Avail.: National Technical Information Service (NTIS)

Climate variability and change can negatively impact sensitive coral reef ecosystems by altering sea surface temperatures, ocean carbonate concentrations, sea level, storm surges, precipitation patterns, stream flows to the coast, salinity, and pollution loads. This report focuses on the coral reefs of American Samoa as a case study for how managers can approach (1) assessments of reef vulnerabilities to climate change and interacting stressors, (2) identification of adaptive management strategies in response, and (3) integration of management options with existing decision processes and mandates. Large-scale climate stressors in American Samoa to assess reef vulnerabilities to climate-related impacts such as coral bleaching. Based on this information, this information, this report presents some adaptive management strategies that could be implemented immediately (e.g., water quality improvements), in the near-term (e.g., enhanced strategic monitoring), and in the long-term (e.g., resilience planning). In each case, management options are considered in a decision making context i.e., in terms of how such strategies relate to existing plans, processes, and mandates.
NTIS
Climate Change; Coral Reefs; Samoa

20080030134 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GPM Pre-Launch Algorithm Development for Physically-Based Falling Snow Retrievals
Jackson, Gail Skofronick; Tokay, Ali; Kramer, Anne W.; Hudak, David; July 07, 2008; 1 pp.; In English; 2008 IEEE International Geoscience and Remote Sensing Symposium, 7-11 Jul. 2008, Boston, MA, USA; Copyright; Avail.: Other Sources; Abstract Only

In this work we compare and correlate the long time series (Nov.-March) n~easurements of precipitation rate from the Parsivels and 2DVD to the passive (89, 150, 183+/-1, +/-3, +/-7 GHz) observations of NOAA's AMSU-B radiometer. There are approximately 5-8 AMSU-B overpass views of the CARE site a day. We separate the comparisons into categories of no precipitation, liquid rain and falling snow precipitation. Scatterplots between the Parsivel snowfall rates and AMSU-B brightness temperatures (TBs) did not show an exploitable relationship for retrievals. We further compared and contrasted brightness temperatures to other surface measurements such as temperature and relative humidity with equally unsatisfying results. We found that there are similar TBs (especially at 89 and 150 GHz) for cases with falling snow and for non-precipitating cases. The comparisons indicate that surface emissivity contributions to the satellite observed TB over land can add uncertainty in detecting and estimating falling snow. The newest results show that the cloud icc scattering signal in the AMSU-B data call be detected by computing clear air TBs based on CARE radiosonde data and a rough estimate of surface emissivity. That is the differences in computed TI3 and AMSU-B TB for precipitating and nonprecipitating cases are unique such that the precipitating versus ~lon-precipitating cases can be identified. These results require that the radiosonde releases are within an hour of the AMSU-B data and allow for three surface types: no snow on the ground, less than 5 cm snow on the ground, and greater than 5 cm on the ground (as given by ground station data). Forest fraction and measured emissivities were combined to calculate the surface emissivities. The above work and future work to incorporate knowledge about falling

snow retrievals into the framework of the expected GPM Bayesian retrievals will be described during this presentation.
Author
Time Series Analysis; Snow; Ground Stations; Atmospheric Temperature; Radiometers; Brightness Temperature; Estimating; Humidity; Algorithms

20080030197 NASA Goddard Space Flight Center, Greenbelt, MD, USA
OMI Tropospheric NO2 from Lightning in Observed Convective Events
Pickering, Kenneth; Bucsela, Eric; Gleason, James; Levelt, Pieternel; September 10, 2007; 1 pp.; In English; Royal Netherlands Meteorological Institute, 10-13 Sep. 2007, DeBilt, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

Lightning is responsible for an estimated 10-20% of NO(x) emissions in the troposphere. In this study, we present evidence of lightning-generated NO2 (LNO2) using data from the Ozone Monitoring Instrument (OMI), which has observed tropospheric NO2 since its launch in 2004. Although LNO2 has been also reported in previous satellite studies from the Global Ozone Monitoring Experiment (GOME) and SCIAMACHY, OMI is better suited for such measurements by virtue of its higher resolution and daily global coverage. The LNO2 signal is clearly seen in OMI data on two days over and downwind of convective systems in the US Midwest in 2006. We also present an analysis of OMI data over northern Australia during the SCOUT-O3/ACTIVE field campaigns in November and December 2005. Both single- and multi-day averages are presented to examine possible LNO2 signals from individual diurnally recurrent convective events. In these events we compare the OMI signals with aircraft observations from the storm anvils.
Author
Storms; Nitrogen Dioxide; Lightning; Convection; Troposphere

20080030214 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Global Precipitation Climatology Project (GPCP): Results, Status and Future
Adler, Robert F.; September 24, 2007; 1 pp.; In English; The Joint 2007 EUMETSAT Meteorlogical Satellite Conference and the 15th American Meteorological Society Satellite Meteorology and Oceanography Conf./EUMETSAT, 24-28 Sep. 2007, Amsterdam, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

The Global Precipitation Climatology Project (GPCP) is one of a number of long-term, satellite-based, global analyses routinely produced under the auspices of the World Climate Research Program (WCRP) and its Global Energy and Watercycle EXperiment (GEWEX) program. The research quality analyses are produced a few months after real-time through the efforts of scientists at various national agencies and universities in the U.S., Europe and Japan. The primary product is a monthly analysis of surface precipitation that is globally complete and spans the period 1979-present. There are also pentad analyses for the same period and a daily analysis for the 1997-present period. Although generated with somewhat different data sets and analysis schemes, the pentad and daily data sets are forced to agree with the primary monthly analysis on a grid box by grid box basis. The primary input data sets are from low-orbit passive microwave observations, geostationary infrared observations and surface raingauge information. Examples of research with the data sets are discussed, focusing on tropical (25N-25s) rainfall variations and possible long-term changes in the 28-year (1979-2006) monthly dataset. Techniques are used to discriminate among the variations due to ENSO, volcanic events and possible long-term changes for rainfall over both land and ocean. The impact of the two major volcanic eruptions over the past 25 years is estimated to be about a 5% maximum reduction in tropical rainfall during each event. Although the global change of precipitation in the data set is near zero, a small upward linear change over tropical ocean (0.06 mm/day/l0yr) and a slight downward linear change over tropical land (-0.03 mm/day/l0yr) are examined to understand the impact of the inhomogeneity in the data record and the length of the data set. These positive changes correspond to about a 5% increase (ocean) and 3% increase (ocean plus land) during this time period. Relations between variations in surface temperature and precipitation are analyzed on seasonal to inter-decadal time scales. A new, version 3 of GPCP is being planned to incorporate new satellite information (e.g., TRMM) and provide higher spatial and temporal resolution for at least part of the data record. The goals and plans for that GPCP re-processing will be outlined.
Author
Precipitation (Meteorology); Climatology; Annual Variations; Climate Change

20080030215 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Joint Aerosol-Monsoon Experiment (JAMEX): A Core Element for the Asian Monsoon Year (2008-2009)
Lau, William K.M.; October 23, 2007; 1 pp.; In English; Topics in Atmospheric and Oceanic Sciences Seminar, 23-24 Oct. 2007, Stony Brook, NY, USA; No Copyright; Avail.: Other Sources; Abstract Only

The objective of the Joint Aerosol-Monsoon Experiment (JAMEX) is to unravel the physical mechanisms and multi-scale

interactions associated with aerosol-monsoon water cycle in the Asian Indo-Pacific region towards improved prediction of rainfall in land regions of the Asian monsoon. JAMEX will be planned as a five-year (2007-201 1) multi-national aerosol-monsoon research project, aimed at promoting collaboration, partnership and alignment of ongoing and planned national and international programs. Two coordinated special observing periods (SOP), covering the pre-monsoon (April-May) and the monsoon (June-August) periods is tentatively targeted for 2008 and 2009. The major work on validation and reference site coordination will take place in 2007 through the spring of 2008. A major science workshop is planned after SOP-I1 in 2010. Modeling and satellite data utilization studies will continue throughout the entire period to help in design of the observation arrays and measurement platforms for SOPS. The tentative time schedule, including milestones and research activities is shown in Fig. 1. One of the unique aspects of JAMEX is that it stems from grass-root scientific and societal imperatives, and it bridges a gap in existing national and international research programs. Currently we have identified 10 major national and international projects/programs separately for aerosols and monsoon research planned in the next five years in China, India, Japan, Italy, and the US, that could be potential contributors or partners with JAMEX. These include the Asian-Indo- Pacific Ocean (AIPO) Project and Aerosol Research Project from China, Monsoon Asian Hydro- Atmospheric Science Research and predication Initiative (MAHASRI) from Japan, Continental Tropical Convergence Zone (CTCZ) and Severe Thunderstorm: Observations and Regional Modeling (STORM) from India, Share-Asia from Italy, Atmospheric Brown Cloud (ABC), Pacific Aerosol-Cloud-Dust Experiment (PACDEX), East Asia Study of Tropospheric Aerosol: an International Regional Experiment (East-AIRE), and Radiation Aerosol Joint Observations - Monsoon Experiments over the Gangetic Himalayas Area (Rajo-Megha: dust cloud in Sanskrit) from the US, and Monsoon Asia Integrated Regional Study (MAIR) under the Earth Systems I Science Partnership (ESSP) and WCRP. For JAMEX to succeed, it is crucial for an international body, such as CEOP or an organization under WCRP to provide the science oversight, data policy and stewardship, and to promote collaboration and partnership among national programs. It makes eminent sense for WCRP to expand the concept and the prototype proposed by JAMEX to include all monsoon countries to expand AMY08-09 into an International Monsoon Era (2008- 2013). Such an establishment followed by establishment of an international body for science oversight, and data stewardship will go a long way in promoting coordination and connection among various existing monsoon research programs within WCRP, and with burgeoning national programs on monsoon and aerosol research.

Author

Aerosols; Monsoons; Rain; Meteorology; Earth Sciences; Clouds; Atmospheric Chemistry; Atmospheric Physics

20080030216 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Real-Time Application of Multi-Satellite Precipitation Analysis for Floods and Landslides

Adler, Robert; Hong, Yang; Huffman, George; November 10, 2007; 1 pp.; In English; 2nd Space for Hydrology Workshop, 10-15 Nov. 2007, Geneva, Switzerland; No Copyright; Avail.: Other Sources; Abstract Only

Satellite data acquired and processed in real time now have the potential to provide the spacetime information on rainfall needed to monitor flood and landslide events around the world. This can be achieved by integrating the satellite-derived forcing data with hydrological models and landslide algorithms. Progress in using the TRMM Multi-satellite Precipitation Analysis (TMPA) as input to flood and landslide forecasts is outlined, with a focus on understanding limitations of the rainfall data and impacts of those limitations on flood/landslide analyses. Case studies of both successes and failures will be shown, as well as comparison with ground comparison data sets-- both in terms of rainfall and in terms of flood/landslide events. In addition to potential uses in real-time, the nearly ten years of TMPA data allow retrospective running of the models to examine variations in extreme events. The flood determination algorithm consists of four major components: 1) multi-satellite precipitation estimation; 2) characterization of land surface including digital elevation from NASA SRTM (Shuttle Radar Terrain Mission), topography-derived hydrologic parameters such as flow direction, flow accumulation, basin, and river network etc.; 3) a hydrological model to infiltrate rainfall and route overland runoff; and 4) an implementation interface to relay the input data to the models and display the flood inundation results to potential users and decision-makers, In terms of landslides, the satellite rainfall information is combined with a global landslide susceptibility map, derived from a combination of global surface characteristics (digital elevation topography, slope, soil types, soil texture, and land cover classification etc.) using a weighted linear combination approach. In those areas identified as ‘susceptible’ (based on the surface characteristics), landslides are forecast where and when a rainfall intensity/duration threshold is exceeded. Results are described indicating general agreement with landslide occurrences.

Author

Rain; Space-Time Functions; Floods; Landslides; Hydrology Models; Satellite Observation; Real Time Operation; Forecasting; Algorithms; Drainage

20080030219 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Role of Gravity Waves in Determining Cirrus Cloud Properties

OCStarr, David; Singleton, Tamara; Lin, Ruei-Fong; July 07, 2008; 5 pp.; In English; International Conference on Clouds and Precipitation/ICCP 2008, 5-12 Jul. 2008, Cancun, Mexico; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Cirrus clouds are important in the Earth's radiation budget. They typically exhibit variable physical properties within a given cloud system and from system to system. Ambient vertical motion is a key factor in determining the cloud properties in most cases. The obvious exception is convectively generated cirrus (anvils), but even in this case, the subsequent cloud evolution is strongly influenced by the ambient vertical motion field. It is well know that gravity waves are ubiquitous in the atmosphere and occur over a wide range of scales and amplitudes. Moreover, researchers have found that inclusion of statistical account of gravity wave effects can markedly improve the realism of simulations of persisting large-scale cirrus cloud features. Here, we use a 1 -dimensional (z) cirrus cloud model, to systematically examine the effects of gravity waves on cirrus cloud properties. The model includes a detailed representation of cloud microphysical processes (bin microphysics and aerosols) and is run at relatively fine vertical resolution so as to adequately resolve nucleation events, and over an extended time span so as to incorporate the passage of multiple gravity waves. The prescribed gravity waves 'propagate' at 15 m s (sup -1), with wavelengths from 5 to 100 km, amplitudes range up to 1 m s (sup -1)'. Despite the fact that the net gravity wave vertical motion forcing is zero, it will be shown that the bulk cloud properties, e.g., vertically-integrated ice water path, can differ quite significantly from simulations without gravity waves and that the effects do depend on the wave characteristics. We conclude that account of gravity wave effects is important if large-scale models are to generate realistic cirrus cloud property climatology (statistics).

Author

Cirrus Clouds; Climatology; Cloud Physics; Clouds (Meteorology); Gravity Waves

20080030220 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Transport of Aerosols: Regional and Global Implications for Climate, Weather, and Air Quality

Chin, Mian; Diehl, Thomas; Yu, Hongbin; Bian, Huisheng; Remer, Lorraine; Kahn, Ralph; May 30, 2008; 1 pp.; In English; From Deserts to Monsoons: Aerosols and Their Impacts at Regional and Global Scales, 30 May - 6 Jun. 2008, Crete, Greece; Copyright; Avail.: Other Sources; Abstract Only

Long-range transport of atmospheric aerosols can have a significant impact on global climate, regional weather, and local air quality. In this study, we use a global model GOCART together with satellite data and ground-based measurements to assess the emission and transport of pollution, dust, biomass burning, and volcanic aerosols and their implications. In particular, we will show the impact of emissions and long-range transport of aerosols from major pollution and dust source regions to (1) the surface air quality, (2) the atmospheric heating rates, and (3) surface radiation change near the source and downwind regions.

Author

Aerosols; Air Quality; Climatology; Weather; Transport Theory

20080030231 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Inter-annual and Long-term Temperature Variations in the Mesopause Region at High Latitudes Generated by the Stratospheric QBO

Mayr, Hans G.; Mengel, John G.; Huang, Frank T.; December 2007; 1 pp.; In English; American Geophysical Union Fall Meeting, December 2007; Copyright; Avail.: Other Sources; Abstract Only

The Numerical Spectral Model (NSM) simulates the Quasi-biennial Oscillation (QBO) that dominates the zonal circulation of the lower stratosphere at low latitudes. In the model, the QBO is generated with parameterized small-scale gravity waves (GW), which are partially augmented in 3D with planetary waves owing to baroclinic instability. Due to GW filtering, the QBO extends into the upper mesosphere, evident in UARS zonal wind and TIMED temperature measurements. While the QBO zonal winds are confined to equatorial latitudes, even in simulations with latitude-independent wave source, the associated temperature variations extend to high latitudes. The meridional circulation redistributes some of the QBO energy to focus it partially onto the Polar Regions. The resulting QBO temperature variations away from the equator tend to increase at higher altitudes to produce inter-annual variations that can exceed 5 K in the polar mesopause region -- and our 3D model simulations show that the effect is variable from year to year and can produce large differences between the two hemispheres, presumably due to interactions involving the seasonal variations. Modeling studies with the NSM have shown that long-term variations can also be generated by the QBO interacting with the seasonal cycles through OW node-filtering. A 30-month QBO, optimally synchronized by the 6-month Semi-Annual Oscillation (SAO), thus produces a 5-year or

semi-decadal (SD) oscillation -- and observational evidence for that has been provided by a recent analysis of stratospheric NCEP data. In a simulation with the 2D version of the NSM, this SD oscillation extends into the upper mesosphere, and we present results to show that the related temperature variations could contribute significantly to the long-term variations of the polar mesopause region. Quasi-decadal variations could furthermore arise from the modeled solar cycle modulations of the QBO and 12-month annual oscillation. Our numerical results are discussed in the context of the observed low summer temperatures reproduced by the model, to demonstrate that the above interannual and long-term variations could contribute significantly to the climatology of Polar Mesospheric Clouds (PMC) investigated by the Aeronomy of Ice in the Mesosphere (AIM) mission.
Author
Mathematical Models; Spectral Theory; Quasi-Biennial Oscillation; Periodic Variations; Planetary Waves; Mesosphere; Climatology; Atmospheric Temperature; Gravity Waves; Zonal Flow (Meteorology)

20080030232 NASA Goddard Space Flight Center, Greenbelt, MD, USA
OMI Tropospheric NO2 from Lightning in Observed Convective Events
Pickering, Kenneth; Bucsela, Eric; Kucsera, Tom; Pan, Laura; Davis, Chris; Gleason, James; Levelt, Pieternel; December 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Lightning is responsible for an estimated 15 percent of total NO emissions, and is one of the most prominent sources in the upper troposphere. In this study, we present evidence of lightning-generated NO2 (LNO2) using data from the Ozone Monitoring Instrument (OMI), which has observed tropospheric NO2 since its launch in 2004. Although LNO2 has been also reported in previous satellite studies from the Global Ozone Monitoring Experiment (GOME) and SCIAMACHY, OMI is better suited for such measurements by virtue of its higher spatial resolution and daily global coverage. We will present data clearly showing the LNO2 signal in the OMI tropospheric NO2 product on two days over and downwind of specific convective systems in the US Midwest. Gridded monthly mean tropospheric NO 2 data are subtracted from the daily gridded data to obtain the presumed LNO2 signal. Observed cloud-to-ground (CG) lightning flashes from the National Lightning Detection Network (NLDN) were counted along middle and upper tropospheric back trajectories that were run from the regions containing the LNO2 signal. A vertically-weighted average number of upwind CG flashes was obtained using a profile of LNO(x) mass obtained from a series of midlatitude cloud-resolved storm chemistry simulations. The number of CG flashes was scaled up to total flashes (intracloud (IC) flashes plus CG) using a climatological IC/CG ratio. The number of moles of LNO(x) in the region considered was estimated by assuming that LNO2 is 30 percent of LNO(x). This value was divided by the number of upwind flashes to obtain an average estimate of the number of moles produced per flash. Results yield values in the range obtained through other estimation techniques (e.g., aircraft measurements, models). We will also present a similar analysis over northern Australia during the SCOUT-O3/ACTIVE field campaigns in November and December 2005, in which we will compare the OMI LNOx signals with aircraft observations from the storm anvils.
Author
Lightning; Meteorological Parameters; Cloud-to-Ground Discharges; Ozone; Spatial Resolution; Climatology; Convection

20080030243 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Global Precipitation Measurement (GPM) Mission: Overview and U.S. Science Status
Hou, Arthur Y.; September 23, 2007; 1 pp.; In English; 2007 EUMETSAT Satellite Conference, 23-27 Sep. 2007, Amsterdam, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

The Global Precipitation Measurement (GPM) Mission, an international satellite mission to unify and advance space-based precipitation measurements around the globe, is a science mission with integrated application goals. The mission is designed to (1) advance the knowledge of the global water cycle and freshwater availability, and (2) improve weather, climate, and hydrological prediction capabilities through more accurate and frequent measurements of global precipitation. The cornerstone of GPM is the deployment of a Core Spacecraft in a unique 65 deg-inclined orbit to serve as a physics observatory and a calibration reference to improve the accuracy of precipitation measurements by a heterogeneous constellation of dedicated and operational passive microwave sensors. The Core Spacecraft will carry a dual-frequency (Ku-Ka band) radar and a multi-channel microwave radiometer with high-frequency capabilities to provide measurements of 3-D precipitation structures and microphysical properties, which are key to achieving a better understanding of precipitation processes and improved retrieval algorithms for passive microwave radiometers. The GPM constellation is envisioned to comprise 5 or more conical-scanning microwave radiometers provided by partners, augmented by cross-track microwave sounders on operational satellites such as the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP), POES, NPOESS, and MetOp satellites for improved sampling over land. The GPM Mission is currently a partnership between NASA and the Japan Aerospace Exploration Agency (JAXA), with opportunities for

additional international partners in constellation satellites and ground validation. An overview of the GPM mission concept and science activities in the USA will be presented.
Author
Precipitation (Meteorology); Precipitation Measurement; Microwave Radiometers; Meteorological Radar; Radar Measurement; Satellite Observation; Meteorological Satellites; Satellite-Borne Radar; Satellite-Borne Instruments

20080030246 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Global Precipitation Measurement (GPM) Mission: Overview and U.S. Science Status
Hou, Arthur; July 23, 2007; 1 pp.; In English; International Geoscience and Remote Sensing Symposium (IGRASS) 2007, 23-27 Jul. 2007, Barcelona, Spain; No Copyright; Avail.: Other Sources; Abstract Only

The Global Precipitation Measurement (GPM) Mission, an international satellite mission to unify and advance space-based precipitation measurements around the globe, is a science mission with integrated application goals. The mission is designed to (1) advance the knowledge of the global water cycle and freshwater availability, and (2) improve weather, climate, and hydrological prediction capabilities through more accurate and frequent measurements of global precipitation. The cornerstone of GPM is the deployment of a Core Spacecraft in a unique 65 deg-inclined orbit to serve as a physics observatory and a calibration reference to improve the accuracy of precipitation measurements by a heterogeneous constellation of dedicated and operational passive microwave sensors. The Core Spacecraft will carry a dual-frequency (Ku-Ka band) radar and a multi-channel microwave radiometer with high-frequency capabilities to provide measurements of 3-D precipitation structures and microphysical properties, which are key to achieving a better understanding of precipitation processes and improved retrieval algorithms for passive microwave radiometers. The GPM constellation is envisioned to comprise 5 or more conical-scanning microwave radiometers provided by partners, augmented by cross-track microwave sounders on operational satellites such as the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP), POES, NPOESS, and MetOp satellites for improved sampling over land. The GPM Mission is currently a partnership between NASA and the Japan Aerospace Exploration Agency (JAXA), with opportunities for additional international partners in constellation satellites and ground validation. An overview of the GPM mission concept and science activities in the USA will be presented.
Author
Precipitation Measurement; Precipitation (Meteorology); Microwave Sensors; Meteorological Radar; Microwave Radiometers; Microwave Sounding; Satellite Observation

20080030251 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Global Precipitation Measurement (GPM) Project
Azarbarazin, Ardeshir Art; Carlisle, Candace C.; [2008]; 14 pp.; In English; 2008 IEEE International Geoscience and Remote Sensing Symposium, 7-11 Jul. 2008, Boston, MA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030251

The GIobd Precipitation hleasurement (GPM) mission is an international cooperati~ee ffort to advance weather, climate, and hydrological predictions through space-based precipitation measurements. The Core Observatory will be a reference standard to uniform11 calibrate data from a constellatism of spacecraft with passive microuave sensors. GP3l mission data will be used for scientific research as well as societal applications. GPM is being developed under a partnership between the USA (US) National .Aeronautics and Space Administration (XASA) and the Japanese Aerospace and Exploration Agency (JAYA). NASA is developing the Core Observatory, a Low-Inclination Constellation Observatory, two GPM Rlicrowave Imager (GXII) instruments. Ground Validation System and Precipitation Processing System for the GPRl mission. JAXA will provide a Dual-frequency Precipitation Radar (DPR) for installation on the Core satellite and launch services for the Core Observatory. Other US agencies and international partners contribute to the GPkf mission by providing precipitation measurements obtained from their own spacecraft and,'or providing ground-based precipitation measurements to support ground validation activities. The GPM Core Observatory will be placed in a low earth orbit (-400 krn) with 65-degree inclination, in order to calibrate partner instruments in a variety of orbits. The Core Observatory accommodates 3 instruments. The GkfI instrument provides measurements of precipitation intensity and distribution. The DPR consists of Ka and Ku band instruments, and provides threedimensional measurements of cloud structure, precipitation particle size distribution and precipitation intensitj and distribution. The instruments are key drivers for GPM Core Observatory overall size (1 1.6m x 6.5m x 5.0m) and mass (3500kg), as well as the significant (-1 950U.3 power requirement. The Core Spacecraft is being built in-house at Goddard Space Flight Center. The spacecraft structure consists of an aluminum lower bus structure. composite upper bus structure, '-axis steerable High Gain Antenna System on a dual-hinged boom, and two deploy able solar arraq s. The propulsion system

features twelve thrusters and a single Composite Overlv~apP ressure Vessel tank. The GPhl Core spacecraft is one of the first large spacecraft developed to be demiseable (i.e. burn up upon atmospheric reentry j. The spacecraft dernissable components--structure. propulsion tank, lithium-ion battery, sotar array md reaction wheels. are a unique fcature.
Author
Precipitation Measurement; Meteorological Radar; Superhigh Frequencies; Cloud Physics; Atmospheric Entry; Precipitation (Meteorology); Remote Sensing

20080030332 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Simple Stochastic Model for Generating Broken Cloud Optical Depth and Top Height Fields
Prigarin, Sergei M.; Marshak, Alexander; December 09, 2007; 30 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): DE-A105-90ER61069; NSF 05-1000008-8024; RFBR-06-05-54484; NSh-4774.2006.1; 621-30-86; 622-42-57; Copyright; Avail.: CASI: A03, Hardcopy

A simple and fast algorithm for generating two correlated stochastic twodimensional (2D) cloud fields is described. The algorithm is illustrated with two broken cumulus cloud fields: cloud optical depth and cloud top height retrieved from Moderate Resolution Imaging Spectrometer (MODIS). Only two 2D fields are required as an input. The algorithm output is statistical realizations of these two fields with approximately the same correlation and joint distribution functions as the original ones. The major assumption of the algorithm is statistical isotropy of the fields. In contrast to fractals and the Fourier filtering methods frequently used for stochastic cloud modeling, the proposed method is based on spectral models of homogeneous random fields. For keeping the same probability density function as the (first) original field, the method of inverse distribution function is used. When the spatial distribution of the first field has been generated, a realization of the correlated second field is simulated using a conditional distribution matrix. This paper is served as a theoretical justification to the publicly available software that has been recently released by the authors and can be freely downloaded from http://i3rc.gsfc.nasa.gov/Public codes clouds.htm. Though 2D rather than full 3D, stochastic realizations of two correlated cloud fields that mimic statistics of given fields have proved to be very useful to study 3D radiative transfer features of broken cumulus clouds for better understanding of shortwave radiation and interpretation of the remote sensing retrievals.
Author
Algorithms; Cloud Height Indicators; Cumulus Clouds; Distribution Functions; Remote Sensing; MODIS (Radiometry); Imaging Spectrometers; Mathematical Models; Correlation

20080030357 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Impact of Microphysics on Intensity and Structure of Hurricanes and Mesoscale Convective Systems
Tao, Wei-Kuo; Shi, Jainn J.; Jou, Ben Jong-Dao; Lee, Wen-Chau; Lin, Pay-Liam; Chang, Mei-Yu; November 06, 2007; 1 pp.; In English; Conference on Mesoscale meteorology and Typhoon, 6-8 Nov. 2007, Taipei,, Taiwan, Province of China; Copyright; Avail.: Other Sources; Abstract Only

During the past decade, both research and operational numerical weather prediction models, e.g. Weather Research and Forecast (WRF) model, have started using more complex microphysical schemes originally developed for high-resolution cloud resolving models (CRMs) with a 1-2 km or less horizontal resolutions. WRF is a next-generation mesoscale forecast model and assimilation system that has incorporated modern software framework, advanced dynamics, numeric and data assimilation techniques, a multiple moveable nesting capability, and improved physical packages. WRF model can be used for a wide range of applications, from idealized research to operational forecasting, with an emphasis on horizontal grid sizes in the range of 1-10 km. The current WRF includes several different microphysics options such as Purdue Lin et al. (1983), WSM 6-class and Thompson microphysics schemes. We have recently implemented three sophisticated cloud microphysics schemes into WRF. The cloud microphysics schemes have been extensively tested and applied for different mesoscale systems in different geographical locations. The performances of these schemes have been compared to those from other WRF microphysics options. We are performing sensitivity tests in using WRF to examine the impact of six different cloud microphysical schemes on precipitation processes associated hurricanes and mesoscale convective systems developed at different geographic locations [Oklahoma (IHOP), Louisiana (Hurricane Katrina), Canada (C3VP - snow events), Washington (fire storm), India (Monsoon), Taiwan (TiMREX - terrain)]. We will determine the microphysical schemes for good simulated convective systems in these geographic locations. We are also performing the inline tracer calculation to comprehend the physical processes (i.e., boundary layer and each quadrant in the boundary layer) related to the development and structure of hurricanes and mesoscale convective systems.
Author
Cloud Physics; Hurricanes; Mathematical Models; Mesometeorology; Mesoscale Phenomena; Weather Forecasting

20080030382 Delaware Univ., Newark, DE USA

Measurements of Ocean Surface Turbulence and Wave-Turbulence Interactions (PREPRINT)

Veron, Fabrice; Melville, W K; Lenain, Luc; Feb 19, 2008; 43 pp.; In English

Contract(s)/Grant(s): NSF-OCE-01-18449

Report No.(s): AD-A479627; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479627

The uppermost layers of the ocean, along with the lower atmospheric boundary layer, play a crucial role in the air-sea fluxes of momentum, heat, and mass, thereby providing important boundary conditions for both the atmosphere and the oceans that control the evolution of weather and climate. In particular, the fluxes of heat and gas rely on exchange processes through the molecular layers, which are usually located within the viscous layer, which is in turn modulated by the waves and the turbulence at the free surface. The understanding of the multiple interactions between molecular layers, viscous layers, waves, and turbulence is therefore paramount to an adequate parameterization of these fluxes. In this paper, the authors present evidence of a clear coupling between the surface waves and the surface turbulence. When averaged over time scales longer than the wave period, this coupling yields a spatial relationship between surface temperature, divergence, and vorticity fields that is consistent with spatial patterns of Langmuir turbulence. The resulting surface velocity field is hyperbolic, suggesting that significant stretching takes place in the surface layers. On time scales for which the surface wave field is resolved, they show that the surface turbulence is modulated by the waves in a manner qualitatively consistent with rapid distortion theory. DTIC

Air Water Interactions; Marine Environments; Ocean Surface; Surface Temperature; Surface Waves; Turbulence; Water Waves; Wave Interaction

20080030387 Washington Univ., Seattle, WA USA

Probabilistic Quantitative Precipitation Forecasting using a Two-Stage Spatial Model

Berrocal, Veronica J; Raftery, Adrian E; Gneiting, Tilmann; Apr 8, 2008; 32 pp.; In English

Contract(s)/Grant(s): N00014-01-10745

Report No.(s): AD-A479644; UW-STAT-TR-532; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479644

Short-range forecasts of precipitation fields are required in a wealth of agricultural, hydrological, ecological and other applications. Forecasts from numerical weather prediction models are often biased and do not provide uncertainty information. Here we present a postprocessing technique for such numerical forecasts that produces correlated probabilistic forecasts of precipitation accumulation at multiple sites simultaneously. The statistical model is a spatial version of a two-stage model that describes the distribution of precipitation with a mixture of a point mass at zero and a Gamma density for the continuous distribution of precipitation accumulation. Spatial correlation is captured by assuming that two Gaussian processes drive precipitation occurrence and precipitation amount, respectively. The first process is latent and governs precipitation occurrence via a truncation. The second process explains the spatial correlation in precipitation accumulation. It is related to precipitation via a site-specific transformation function, so to retain the marginal right-skewed distribution of precipitation while modeling spatial dependence. Both processes take into account the information contained in the numerical weather forecast and are modeled as stationary, isotropic spatial processes with an exponential correlation function. The two-stage spatial model was applied to forecasts of daily precipitation accumulation over the Pacific Northwest in 2004, at a prediction horizon of 48 hours. The predictive distributions from the two-stage spatial model were calibrated and sharp, and out-performed reference forecasts for spatially composite and areally averaged quantities.
DTIC

Forecasting; Precipitation (Meteorology); Prediction Analysis Techniques

20080030396 Naval Postgraduate School, Monterey, CA USA

The Role of Subtropical Intrusion in the Development of Typhoon Usagi (5W) 2007

DeLeon, Raymund P; Mar 2008; 118 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479679; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479679

During July 2007, fields from both the NCEP GFS final analyses and ECMWF model of OW and SF analyses suggests the development of two distinct areas with sub-tropical intrusion from remnants of a decaying baroclinic system in the WNP. This analysis of the formation of Usagi points to sub-tropical intrusion of a strong lower-tropospheric baroclinic system undergoing decay as potential seedlings for typhoon formation in areas of high sea surface temperatures, weak low-level vertical wind shear, and persistent convection. As the PV anomalies is stretched and detached from the baroclinic source

region, it is wrapped around a strong tropospheric anticyclone in the subtropics. This constitutes a different type of baroclinic initiation process than has been previously identified in Atlantic cyclone formation events associated with TT, which are induced by upper-level troughs. The area of high values of OW at the tip of a PV streamer favors sustained deep convection, which will enhance the low-level vorticity and moisten the mid-level thereby producing high values of SF. The area of strong vorticity at the tip of the second PV streamer possessed both high OW and SF, favoring deep convection and cyclonic vortex tube stretching that appeared to culminate in an enhancement of lower tropospheric cyclonic vorticity. Although this analysis was originally motivated by initial analyses suggesting that ex-hurricane Cosme underwent a direct vorticity interaction with the second PV streamer, our revised hypothesis on the role of Cosme is that it may have enlarged the wave pouch and helped preserve the mid-tropospheric circulation from hostile outside influences. In this sense, the Cosme wave may have played an important indirect role in the formation of Usagi. This hypothesis requires further investigation.
DTIC
Intrusion; Sea Water; Surface Temperature; Temperate Regions; Tropical Regions; Typhoons

20080030428 Naval Postgraduate School, Monterey, CA USA
Predicting Hail Size Using Model Vertical Velocities
Barnhart, Gregory J; Mar 2008; 67 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479787; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479787

A simple test hail growth model is created in order to compare hailstone sizes from model vertical velocities and calculated updrafts from a simple cloud model using forecasted soundings. The models used MM5 model data coinciding with severe hail events collected from the Central and Southern Plains from March to May 2006 and 2007. In the test model, four different starting embryo sizes were interjected into four separate hail growth modes: dry growth and wet growth using model vertical velocities and dry and wet growths using calculated updrafts. These embryos were placed at four different beginning vertical levels resulting in 64 possible ending hailstone sizes. Examination of the 804 hail events revealed the potential usefulness of model vertical velocities in generating severe hailstones. In particular, using dry growth, the model vertical velocities produced 727 severe hailstones compare to 661 produced by dry growth using the thermodynamically calculated updraft. Model vertical velocities also proved more accurate than updrafts, resulting in an average error of 0.417 compare to 0.788 under dry growth conditions. Calculated updrafts were still required to generate the large severe hail that model vertical velocities could not produce.
DTIC
Forecasting; Hail; Predictions

20080030441 Naval Postgraduate School, Monterey, CA USA
Modeling Atmospheric Effects on Wireless Networks
Bleidorn, Amy; Mar 1, 2008; 79 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479822; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479822

Wireless communications infrastructures can extend command and control rapidly across the battle space. This study analyzed signal propagation measurements from an 802.16 link in comparison to effects-based model output. The atmospheric data included in situ measurements, numerical weather model data, and standard profiles routinely used by operators. The network studied was located in a region of highly variable terrain and vegetation in Northern Thailand during the COASTS 2007 field experiments. Received signal data showed a weak correlation with predicted values using Advanced Refractive Effects Prediction System (AREPS) with in situ and model weather data. Additional comparisons with Interactive Scenario Builder (Builder) did now show similar performance as a tactical decision aid using variable propagation conditions.
DTIC
Atmospheric Effects; Communication Networks; Mathematical Models; Meteorological Parameters; Network Analysis; Radiotelephones

20080030443 Naval Postgraduate School, Monterey, CA USA
Evaluation of Daytime Boundary Layer Heights from a Mesoscale Model Using Profilers/RASS Measurements
Bloch, Lindsay A; Mar 1, 2008; 91 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479824; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479824

This thesis study focuses on the evaluation of the boundary layer height (BLH) diagnosed from a mesoscale model in

comparison to wind profiler/Radio Acoustic Sounding System (RASS) measurements from the profiler site at Miramar Marine Corps Station (MMR). This objective is met through validation of the observed BLH and evaluations of the model BLH using the observed BLH's. In particular, two methods, one uses Signal-to-Noise-Ratio (SNR) from the profiler, and the other uses the vertical gradient of virtual potential temperature from RASS, were developed to detect BLH from the profiler/RASS systems. The detected BLH was validated against BLH from rawinsonde measurements. The SNR method gives a better mean BLH in the clear convective unstable BL's while the gradient method shows better correlation with the rawinsonde BLH. The Weather Research and Forecasting (WRF) model for the inland location (MMR) was compared to these profiler BLH estimates. Although WRF reasonably predicts the general BL behavior, WRF underestimated the BLH by several hundred meters. The WRF diagnosed BLH using the bulk Richardson number was inconsistent with the WRF predicted BL thermodynamics structure. An alternative BLH detection scheme using a gradient method of BLH detection is proposed and tested for WRF, showing better results.
DTIC
Boundary Layers; Daytime; Forecasting; Height; Mesoscale Phenomena; Signal to Noise Ratios

20080030444 Naval Postgraduate School, Monterey, CA USA
Global Model Forecasts of 2005 Atlantic Tropical Cyclone Formations After Post-Processing to Account for Initial Intensity
Chesser, Stephen G; Mar 1, 2008; 125 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479826; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479826

The objective of this thesis was to test the impact on Atlantic tropical cyclone formation forecasts during 2005 by three global models via a post-processing technique of adjusting the initial conditions to match the National Hurricane Center initial intensity information contained in the Combined Automated Response to Query (CARQ). Histograms of model analyses of the 850 500 mb relative vorticity and the 700 500 mb warm core, which are derived from the VORTRACK files, are created for CARQ intensities of 20 kt, 25 kt, 30 kt, and 35 kt, and then are used to derive Lower Tercile Values (LTVs). These LTVs of relative vorticity and warm core for each model are used to adjust the initial conditions to agree with the CARQ intensity, and the LTV35 is considered to be the threshold intensity value for formation. These adjusted model forecasts are all superior to the unadjusted forecasts because many of the false alarms are eliminated. The adjusted model forecasts of relative vorticity and warm core are also converted into equivalent intensity forecasts, and a consensus of these intensities provides a useful indication of the evolution of an incipient tropical disturbance toward the tropical storm stage.
DTIC
Atlantic Ocean; Cyclones; Forecasting; Hurricanes; Tropical Storms

20080030473 Naval Postgraduate School, Monterey, CA USA
Verification of the AFWA 3-Element Severe Weather Forecast Algorithm
Pagliaro, Daniel E; Mar 2008; 107 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479883; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479883

Accurate severe thunderstorm forecasts are critical to providing sufficient lead-time to protect lives and property The Air Force Weather Agency has developed a 3-Element Severe Weather Forecast Algorithm that when applied to model forecasts gives and outlook region for severe thunderstorms improvements were made in this study to enhance the algorithm's forecast skill, reduce its false alarm rate, and thereby increase the amount of lead-time for installation commanders to take decisive action to protect personnel and resources. This paper discusses the performance of the 3-Element Algorithm in its original form, and the adjustments made to overcome some of its limitations.
DTIC
Algorithms; Forecasting; Thunderstorms

20080030498 Naval Postgraduate School, Monterey, CA USA
Japan Sea Thermohaline Structure and Circulation. Part 1: Climatology
Chu, Peter C; Lan, Jian; Fan, Chenwu; Jan 2001; 29 pp.; In English
Report No.(s): AD-A480005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480005

In this study, the U.S. Navy's Generalized Digital Environmental Model (GDEM) climatological temperature and salinity

data on a 0.5 deg x 0.5 deg grid is used to investigate the seasonal variabilities of the Japan/East Sea (JeS) thermohaline structure and circulations. The GDEM for the JES was built up on historical (1930-97) 136 509 temperature and 52 572 salinity profiles. A three-dimensional estimate of the absolute geostrophic velocity field was obtained from the GDEM temperature and salinity fields using the P-vector method. The seasonal variabilities of the thermohaline structure and the inverted currents such as the Subpolar Front, the salinity minimum and maximum in the Japan Sea Intermediate Water, and the Tsushima Warm Current and its bifurcation are identified.
DTIC
Climatology; Japan; Ocean Currents; Seas; Thermohaline Circulation

20080030571 Naval Postgraduate School, Monterey, CA USA
Cloud Phase and the Surface Energy Balance of the Arctic; An Investigation of Mixed-Phase Clouds
Kripchak, Kristopher J; Mar 2008; 83 pp.; In English
Report No.(s): AD-A479968; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study examines the phase relationship (liquid versus ice) in Arctic clouds Although it is recognized that clouds are fundamental components of the surface energy balance, the nature of Arctic cloud phase is poorly understood and may have important implications for feedbacks associated with the rapid disappearance of sea ice. This study uses the annual cycle of cloud, radiation, and meteorological measurements made as part of the Surface Heat Budget of the Arctic Ocean field program to derive empirical relationships for cloud liquid fraction as a function of observed variables. Relative to each other, single-layer liquid, ice, and mixed-phase clouds occurred 17.6%, 39.4%, and 42.9% of the time, respectively. The dominant role that mixed-phase clouds play in the surface energy balance of the Arctic was confirmed, emphasizing the need for their correct parameterization in models at all scales. A linear fit of liquid fraction to cloud base temperature between -36C and +2C predicts 35% of the fraction variance. Including the observed variables of cloud base height and surface wind speed as predictors predicts another 10%.
DTIC
Arctic Ocean; Arctic Regions; Balance; Energy Budgets; Meteorological Parameters; Surface Energy

20080030573 Naval Postgraduate School, Monterey, CA USA
Extensible 3D (X3D) Graphics Clouds for Geographic Information Systems
Murphy, Darren W; Mar 2008; 101 pp.; In English
Report No.(s): AD-A479970; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research evaluates the production of three dimensional (3D) clouds for geospatial viewing programs such as Google Earth, NASA World Wind, and X3D Earth. This thesis took advantage of iso-standard X3D graphics and X3D Edit in conjunction with manually produced image textures to represent 3D clouds. While a 3D geospatial viewing might never completely characterize the current state of the atmosphere, a sufficiently realistic virtual 3D rendering can be created to present current sky coverage given adequate satellite and model data. Various visualization demonstration results are presented that can be rendered and navigated in real time. Further research and development is needed to match a cloud typing model output with a particular method of 3D cloud production. Data-driven adaptation and production of cloud models for web-based delivery is an achievable capability given continued research and development.
DTIC
Geographic Information Systems; Geography; Information Systems

20080030595 Naval Postgraduate School, Monterey, CA USA
Verification of Aerosol Optical Depth Retrievals using Cloud Shadows Retrieved from Satellite Imagery
Sweat, Perry C; Mar 2008; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480027; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A technique for deriving aerosol optical depths by measuring the radiance inside and outside of shaded regions is expanded to include shadows from clouds. Previous research focused on utilizing QuickBird satellite imagery. The 2.4 meter resolution of QuickBird allowed for sampling to focus on building-generated shadows. Research was done on several different surface types, including dirt, grass, sand, and pavement. The research presented in this thesis focuses on the challenges presented by attempting this technique with three other types of imagery Moderate Resolution Imaging Spectrometer (MODIS), IKONOS, and Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER). The lower resolution of MODIS and ASTER does not lend itself to focusing on building shadows, but rather cloud shadows. Results from sampling

cloud-generated shadows show this method has promise, much like previous studies and opens up aerosol optical depth determination using this technique to a wide variety of imagery as well as additional sensor platforms.
DTIC
Aerosols; Optical Thickness; Satellite Imagery; Shadows

20080030602 Naval Postgraduate School, Monterey, CA USA
Long-Range Statistical Forecasting of Korean Summer Precipitation
Tournay, Jr, Robert C; Mar 2008; 145 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We examined long-range statistical forecasting methods for Korean summer precipitation (KSP). We reviewed existing literature on the East Asian summer monsoon to develop a background on current KSP research and on the relationship of KSP to climate variations. Second, we explored interannual variability of KSP using composite and correlation analyses. We found that circulation anomalies in the spring prior to the monsoon in the tropical northwest Pacific alter sea surface temperatures (SST). These SST anomalies then persist into the following summer, leading to summer circulation anomalies that alter the flow into Korea and the precipitation on the seasonal scale. From this relationship, we developed a seasonal forecasting index. Third, we looked at KSP on the intraseasonal scale, to develop statistical forecast methods with five to thirty day leadtimes. We found that the Korean summer monsoon onset, break and withdrawal are positively correlated to the El Ni o / La Ni a state. We found that the Madden-Julian Oscillation (MJO), when conditioned with our seasonal index, showed skill in forecasting with lead times out to 20 days. Last, we found that tropical cyclone activity in Korea is impacted by ENSO on the interannual scale, and MJO on the intraseasonal scale.
DTIC
Forecasting; Summer

20080030614 Mitre Corp., McLean, VA USA
Wind Farms and Radar
Brenner, Michael; Cazares, Shelly; Cornwall, Michael J; Dyson, Freeman; Eardley, Douglas; Horowitz, Paul; Long, Darrell; Sullivan, Jeremiah; Vesecky, John; Weinberger, Peter J; Jan 2008; 21 pp.; In English
Report No.(s): AD-A480068; JSR-08-125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As part of its 2008 Winter Study, JASON was asked by the Department of Homeland Security (DHS) to review the current status of the conflict between the ever-growing number of wind-turbine farms and air-security radars that are located within some tens of miles of a turbine farm.
DTIC
Aircraft Detection; Radar; Security; Wind (Meteorology); Windpower Utilization; Windpowered Generators

20080030616 Naval Postgraduate School, Monterey, CA USA
An Air-Ocean Coupled Nowcast/Forecast System for the East Asian Marginal Seas
Chu, Peter C; Lu, Shihua; Fan, Chenwu; Sep 12, 2000; 7 pp.; In English
Report No.(s): AD-A480073; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The South China Sea (SCS), Yellow/East China Sea (YES), and Japan/East Sea (JES) are major east Asian marginal seas (EAMS). The complex topography includes the broad shallows of the Sunda Shelf in the south/southwest of SCS; the continental shelf of the Asian landmass in the north, extending from the Gulf of Tonkin to the YES; a deep, elliptical shaped SCS and JES basins, and numerous reef islands and underwater plateaus scattered throughout (Fig. 1a). The shelf that extends from the Gulf of Tonkin to the YES is consistently near 70 m deep, and averages 150 km in width. The EAMS is subjected to a seasonal monsoon system. From April to August, the weaker southwesterly summer monsoon winds result in a wind stress of just over 0.1 N/m2. From November to March, the stronger northeasterly winter monsoon winds corresponds to a maximum wind stress of nearly 0.3 N /m2. Recent observational studies show that the EAMS is energetic and has multi-eddy structure. For example, the SCS synoptic eddy structure was identified in May 1995 using the airborne expendable bathythermograph (AXBT) data (Chu et al., 1998a), the eddy spatiotemporal scales in the YES were identified using the Navy's Master Oceanographic Observational Data Set (MOODS) during 1929- 1991 (Chu et al., 1997a,b), and the seasonal JES multi-eddy structure from a composite analysis on the U.S. National Centers for Environmental Prediction (NCEP) monthly SST fields during 1981-1994 (Chu et al. 1998b).
DTIC
Air Water Interactions; Asia; Forecasting; Seas

20080030633 Naval Postgraduate School, Monterey, CA USA

Evidence of a Barrier Layer in the Sulu and Celebes Seas

Chu, Peter C; Liu, Qinyu; Jia, Yinglai; Fan, Chenwu; Nov 2002; 12 pp.; In English

Report No.(s): AD-A480149; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Variability in the surface isothermal and mixed layers of the Sulu and Celebes Seas is examined using the conductivity-temperature- depth data from the Navy's Master Oceanographic Observational Data Set (MOODS). Vertical gradient is calculated to determine isothermal layer depth with a criterion of 0.05 deg C /m for temperature profiles and mixed layer depth with a criterion of 0.015 kg(exp -4) for density profiles. When the isothermal layer depth is larger than the mixed layer depth. the barrier layer occurs. This study shows that the barrier layer occurs often in the Sulu and Celebes Seas. In the Sulu Sea, the barrier layer has seasonal variability with a minimum occurrence (38%) and a minimum thickness (3 m) in May and a maximum occurrence (94%) and a maximum thickness (36.5 m) in September. In the Celebes Sea, the barrier layer thickness changes from a maximum (49.7 - 62.0 m) in March-April to a minimum (9.6 m) in June. Possible mechanisms responsible for the barrier layer formation are discussed. In the Sulu Sea, the barrier layer may be formed by both rainfall and stratification; in the Celebes Sea, a rain-formed mechanism seems a major factor.

DTIC

Barrier Layers; Isothermal Layers; Isotherms; Seas

20080030645 Naval Postgraduate School, Monterey, CA USA

Thermodynamic Feedback Between Clouds and the Ocean Surface Mixed Layer

Chu, P C; Garwood, Jr, Roland W; Mar 20, 1989; 11 pp.; In English

Report No.(s): AD-A480189; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A cloud-ocean planetary boundary layer (OPBL) feedback mechanism is presented and tested in this paper. Water vapor, evaporated from the ocean surface or transported by the large-scale air flow, often forms convective clouds under a conditionally unstable lapse rate. The variable cloud cover and rainfall may base positive and negative feedback with the ocean mixed layer temperature and salinity structure. The coupling of the simplified Kuo's (1965) cumulus cloud model to the Kraus-Turner's (1967) ocean mixed layer model shows the existence of this feedback mechanism. The theory also predicts the generation of low frequency oscillation in the atmosphere and oceans.

DTIC

Cloud Cover; Feedback; Ocean Models; Ocean Surface; Rain; Surface Layers; Thermodynamics

20080030656 Naval Research Lab., Washington, DC USA

Dynamic Mental Models in Weather Forecasting

Trafton, J G; Sep 2004; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-03-WX30001

Report No.(s): AD-A480241; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There are many definitions, descriptions, and usages of the term 'mental model.' Frequently, the definition of mental model is not described, leaving what the author means as an exercise for the reader. I propose a very explicit definition for a dynamic mental model and then show how that definition can be applied in the domain of meteorological forecasting. Specifically, I suggest that a dynamic mental model is a mix of images and propositions, relies on qualitative and spatial relationships, allows dynamic, runnable results to be inspected, and results in an inference. Finally, I offer suggestions on how to improve the usefulness of the term mental model.

DTIC

Dynamic Models; Forecasting; Spatial Distribution

20080030778 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Improved Bulk Microphysical Scheme for Studying Precipitation Processes: Comparisons with Other Schemes

Tao, W. K.; Shi, J. J.; Lang, S.; Chen, S.; Hong, S-Y.; Peters-Lidard, C.; December 10, 2007; 1 pp.; In English; American Geophysical Union Meeting, 10-14 Dec 2007, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Cloud microphysical processes play an important role in non-hydrostatic high-resolution simulations. Over the past decade both research and operational numerical weather prediction models have started using more complex cloud microphysical schemes that were originally developed for high-resolution cloud-resolving models. An improved bulk microphysical parameterization (adopted from the Goddard microphysics schemes) has recently implemented into the Weather Research and Forecasting (WRF) model. This bulk microphysical scheme has three different options --- 2ICE (cloud ice &

snow), 3ICE-graupel (cloud ice, snow & graupel) and 3ICE-hail (cloud ice, snow & hail). High-resolution model simulations are conducted to examine the impact of microphysical schemes on two different weather events (a midlatitude linear convective system and an Atlantic hurricane). In addition, this bulk microphysical parameterization is compared with WIRF's three other bulk microphysical schemes.
Author
Numerical Weather Forecasting; Temperate Regions; Cloud Physics; Convection; Hurricanes; Snow; Hail

20080030779 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New, Improved Goddard Bulk-Microphysical Schemes for Studying Precipitation Processes in WRF
Tao, Wei-Kuo; October 29, 2007; 1 pp.; In English; 2nd International Workshop on High Resolution Modeling of Atmosphere, 29-31 Oct. 2007, Reading, UK; No Copyright; Avail.: Other Sources; Abstract Only

An improved bulk microphysical parameterization is implemented into the Weather Research and Forecasting ()VRF) model. This bulk microphysical scheme has three different options, 2ICE (cloud ice & snow), 3ICE-graupel (cloud ice, snow & graupel) and 3ICE-hail (cloud ice, snow & hail). High-resolution model simulations are conducted to examine the impact of microphysical schemes on two different weather events (a midlatitude linear convective system and an Atlantic hurricane). The results suggest that microphysics has a major impact on the organization and precipitation processes associated with a summer midlatitude convective line system. The Goddard 3ICE scheme with a cloud ice-snow-hail configuration agreed better with observations in terms of rainfall intensity and a narrow convective line than did simulations with a cloud ice-snow-graupel or cloud ice-snow (i.e., 2ICE) configuration. This is because the 3ICE-hail scheme includes dense ice precipitating (hail) particle with very fast fall speed (over 10 in For an Atlantic hurricane case, the Goddard microphysical schemes had no significant impact on the track forecast but did affect the intensity slightly. The improved Goddard schemes are also compared with WRF's three other 3ICE bulk microphysical schemes: WSM6, Purdue-Lin and Thompson. For the summer midlatitude convective line system, all of the schemes resulted in simulated precipitation events that were elongated in the southwest-northeast direction in qualitative agreement with the observed feature. However, the Goddard 3ICE scheme with the hail option and the Thompson scheme agree better with observations in terms of rainfall intensity, expect that the Goddard scheme simulated more heavy rainfall (over 48 mm/h). For the Atlantic hurricane case, none of the schemes had a significant impact on the track forecast; however, the simulated intensity using the Purdue-Lin scheme was much stronger than the other schemes. The vertical distributions of model simulated cloud species (i.e., snow) are quite sensitive to microphysical schemes, which is an important issue for future verification against satellite retrievals. Both the Purdue-Lin and WSM6 schemes simulated very little snow compared to the other schemes for both the midlatitude convective line and hurricane cases. Sensitivity tests are performed for these two WRF schemes to identify that snow productions could be increased by increasing the snow intercept, turning off the auto-conversion from snow to graupel and reducing the transfer processes from cloud-sized particles to precipitation-sized ice.
Author
Forecasting; Parameterization; Linear Systems; Temperate Regions; Snow; Convection; Hail; Hurricanes

20080030781 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Preliminary Evaluation of GEOS-5 Aerosol and CO Distributions Forecast During TC4
Colarco, Peter R.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The NASA Tropical Composition, Cloud, and Climate Coupling (TC4) Mission was based out San Jose, Costa Rica during July and August 2007. During TC4 the NASA Global Modeling and Assimilation Office (GMAO) ran twice-daily 0.5 x 0.666 global 5-day forecasts of the Goddard Earth Observing System atmospheric general circulation model and data assimilation system (GEOS-5). This implementation of GEOS-5 contained an aerosol and carbon monoxide (CO) model to provide online forecast tropospheric distributions of dust, sea salt, sulfate, and carbonaceous aerosols and CO for both the planning of flights and for science. Here we provide a description of the aerosol and CO modeling system and give a preliminary evaluation of forecast tracer distributions. Our comparisons to satellite observations of aerosol and CO show qualitatively similar simulated distributions of tracers to those observed. During TC4 copious amounts of dust were observed in the Caribbean. The model generally reproduced the observations of the timing of dust events and the vertical structure in the lower atmosphere. However, the model simulations had too much aerosol at high altitudes relative to airborne Cloud Physics Lidar observations. The results were similar for biomass burning aerosol and CO tracers, where the model showed higher simulated concentrations of these tracers at aircraft flight altitude than observations.
Author
Aerosols; Carbon Monoxide; Vertical Distribution; Earth Observing System (EOS); Cloud Physics; Satellite Observation; Atmospheric General Circulation Models; Airborne Equipment

20080030785 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Use of Combined A-Train Observations to Validate GEOS Model Simulated Dust Distributions During NAMMA

Nowottnick, E.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

During August 2006, the NASA African Multidisciplinary Analyses Mission (NAMMA) field experiment was conducted to characterize the structure of African Easterly Waves and their evolution into tropical storms. Mineral dust aerosols affect tropical storm development, although their exact role remains to be understood. To better understand the role of dust on tropical cyclogenesis, we have implemented a dust source, transport, and optical model in the NASA Goddard Earth Observing System (GEOS) atmospheric general circulation model and data assimilation system. Our dust source scheme is more physically based scheme than previous incarnations of the model, and we introduce improved dust optical and microphysical processes through inclusion of a detailed microphysical scheme. Here we use A-Train observations from MODIS, OMI, and CALIPSO with NAMMA DC-8 flight data to evaluate the simulated dust distributions and microphysical properties. Our goal is to synthesize the multi-spectral observations from the A-Train sensors to arrive at a consistent set of optical properties for the dust aerosols suitable for direct forcing calculations.

Author

Atmospheric General Circulation Models; Earth Observing System (EOS); Tropical Storms; Dust Storms; Aerosols; MODIS (Radiometry); Imaging Spectrometers; Cyclogenesis

20080030786 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Identification of Stratospheric Waves in Ozone in the Tropics from OMI High Spectral Resolution Measurements

Ziemke, J. R.; Liu, X.; Bhartia, P. K.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Previous studies using Total Ozone Mapping Spectrometer (TOMS) measurements have identified several types of tropical waves in the stratosphere. These waves include Kelvin waves, mixed Rossby-gravity waves, equatorial Rossby waves, and global normal modes. All of these detected waves occur when their zonal phase speeds are opposite the zonal winds in the low-mid stratosphere associated with the Quasi-biennial Oscillation (QBO). Peak-to-peak amplitudes in all cases are typically 5 DU. While total ozone data from TOMS is sensitive in detecting these tropical waves, they provide each day only a single horizontal cross-sectional map. The high spatial and spectral resolution of the Aura Ozone Monitoring Instrument (OMI) provides a unique means to evaluate 3D structure in these waves including their propagation characteristics. Ozone profiles retrieved from OMI radiances for wavelengths 270-310 nm are utilized to examine the nature of these wave disturbances extending from the lower to upper stratosphere.

Author

Atmospheric Composition; Gravity Waves; Quasi-Biennial Oscillation; Spatial Resolution; Total Ozone Mapping Spectrometer; Planetary Waves; Spectral Resolution

20080030788 NASA Goddard Space Flight Center, Greenbelt, MD, USA

SHADOZ in the Aura Era

Witte, J. C.; Thompson, A. M.; Oltmans, S. J.; Schoeberl, M. R.; Bhartia, P. K.; Froidevaux, L.; Schmidlin, F.; Calpini, B.; Shiotani, M.; Fujiwara, M.; Posny, F.; Vomel, H.; Chow, K. K.; Coetzee, G. R.; Kelder, H.; December 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

We present comparisons of observed tropical and sub-tropical ozone from the Southern Hemisphere Additional Ozonesondes (SHADOZ) project with satellite measurements using Aura's Ozone Monitoring Instrument (OMI) and Microwave Limb Sounder (MLS) instruments. Satellite products of total and derived tropospheric column ozone from OMI and profiles of ozone in the UT/LS region from MLS are used.

Author

Ozone; Southern Hemisphere; Microwave Sounding; Ozonesondes

20080030789 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Evaluating the Capacity of Global CO2 Flux and Atmospheric Transport Models to Incorporate New Satellite Observations

Kawa, S. R.; Collatz, G. J.; Erickson, D. J.; Denning, A. S.; Wofsy, S. C.; Andrews, A. E.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

As we enter the new era of satellite remote sensing for CO2 and other carbon cyclerelated quantities, advanced modeling and analysis capabilities are required to fully capitalize on the new observations. Model estimates of CO2 surface flux and atmospheric transport are required for initial constraints on inverse analyses, to connect atmospheric observations to the

location of surface sources and sinks, and ultimately for future projections of carbon-climate interactions. For application to current, planned, and future remotely sensed CO2 data, it is desirable that these models are accurate and unbiased at time scales from less than daily to multi-annual and at spatial scales from several kilometers or finer to global. Here we focus on simulated CO2 fluxes from terrestrial vegetation and atmospheric transport mutually constrained by analyzed meteorological fields from the Goddard Modeling and Assimilation Office for the period 1998 through 2006. Use of assimilated meteorological data enables direct model comparison to observations across a wide range of scales of variability. The biospheric fluxes are produced by the CASA model at lxi degrees on a monthly mean basis, modulated hourly with analyzed temperature and sunlight. Both physiological and biomass burning fluxes are derived using satellite observations of vegetation, burned area (as in GFED-2), and analyzed meteorology. For the purposes of comparison to CO2 data, fossil fuel and ocean fluxes are also included in the transport simulations. In this presentation we evaluate the model's ability to simulate CO2 flux and mixing ratio variability in comparison to in situ observations at sites in Northern mid latitudes and the continental tropics. The influence of key process representations is inferred. We find that the model can resolve much of the hourly to synoptic variability in the observations, although there are limits imposed by vertical resolution of boundary layer processes. The seasonal cycle and its interannual variations generally respond adequately, but discrepancies in the tropics suggest the need for a refinement of the soil moisture dependence of the respiration flux in CASA. Examples and inferences for interpretation of satellite data will be discussed. In general, the fidelity of these simulations leads us to anticipate incorporation of real-time, highly resolved remote sensing and other observations into quantitative analyses that will reduce uncertainty in the terrestrial CO2 sink and revolutionize our understanding of the key processes controlling atmospheric CO2 and its evolution with time. Author

Carbon Dioxide; Remote Sensing; Satellite Observation; Transport Theory; Climatology

20080030790 NASA Goddard Space Flight Center, Greenbelt, MD, USA

What You Need to Know About the OMI NO2 Data Product for Air Quality Studies

Celarier, E. A.; Gleason, J. F.; Bucsela, E. J.; Brinksma, E.; Veefkind, J. P.; December 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

The standard nitrogen dioxide (NO2) data product, produced from measurements by the Ozone Monitoring Instrument (OMI), are publicly available online from the NASA GESDISC facility. Important data fields include total and tropospheric column densities, as well as collocated data for cloud fraction and cloud top height, surface albedo and snow/ice coverage, at the resolution of the OMI instrument (12 km x 26 km, at nadir). The retrieved NO2 data have been validated, principally under clear-sky conditions. The first public-release version has been available since September 2006. An improved version of the data product, which includes a number of new data fields, and improved estimates of the retrieval uncertainties will be released by the end of 2007. This talk will describe the standard NO2 data product, including details that are essential for the use of the data for air quality studies. We will also describe the principal improvements with the new version of the data product.

Author

Air Quality; Nitrogen Dioxide; Ozone; Data Products

20080030950 NASA Langley Research Center, Hampton, VA, USA

NASA Earth Observations Informing Renewable Energy Management and Policy Decision Making

Eckman, Richard S.; Stackhouse, Paul W., Jr.; January 2008; 4 pp.; In English; World Renewable Energy Congress X, 19-25 Jul. 2008, Glasgow, UK; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 389018.02.15.02.11; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030950

The NASA Applied Sciences Program partners with domestic and international governmental organizations, universities, and private entities to improve their decisions and assessments. These improvements are enabled by using the knowledge generated from research resulting from spacecraft observations and model predictions conducted by NASA and providing these as inputs to the decision support and scenario assessment tools used by partner organizations. The Program is divided into eight societal benefit areas, aligned in general with the Global Earth Observation System of Systems (GEOSS) themes. The Climate Application of the Applied Sciences Program has as one of its focuses, efforts to provide for improved decisions and assessments in the areas of renewable energy technologies, energy efficiency, and climate change impacts. The goals of the Applied Sciences Program are aligned with national initiatives such as the U.S. Climate Change Science and Technology Programs and with those of international organizations including the Group on Earth Observations (GEO) and the Committee

on Earth Observation Satellites (CEOS). Activities within the Program are funded principally through proposals submitted in response to annual solicitations and reviewed by peers.
Derived from text
Decision Making; Renewable Energy; NASA Programs; Climatology; Energy Technology

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20080026299 NASA Johnson Space Center, Houston, TX, USA
An Improved Flow Cytometry Method For Precise Quantitation Of Natural-Killer Cell Activity
Crucian, Brian; Nehlsen-Cannarella, Sandra; Sams, Clarence; May 20, 2006; 1 pp.; In English; ISAC International Congress, 20-24 May 2006, Quebec City, Quebec, Canada; Copyright; Avail.: Other Sources; Abstract Only

The ability to assess NK cell cytotoxicity using flow cytometry has been previously described and can serve as a powerful tool to evaluate effector immune function in the clinical setting. Previous methods used membrane permeable dyes to identify target cells. The use of these dyes requires great care to achieve optimal staining and results in a broad spectral emission that can make multicolor cytometry difficult. Previous methods have also used negative staining (the elimination of target cells) to identify effector cells. This makes a precise quantitation of effector NK cells impossible due to the interfering presence of T and B lymphocytes, and the data highly subjective to the variable levels of NK cells normally found in human peripheral blood. In this study an improved version of the standard flow cytometry assay for NK activity is described that has several advantages of previous methods. Fluorescent antibody staining (CD45FITC) is used to positively identify target cells in place of membranepermeable dyes. Fluorescent antibody staining of target cells is less labor intensive and more easily reproducible than membrane dyes. NK cells (true effector lymphocytes) are also positively identified by fluorescent antibody staining (CD56PE) allowing a simultaneous absolute count assessment of both NK cells and target cells. Dead cells are identified by membrane disruption using the DNA intercalating dye PI. Using this method, an exact NK:target ratio may be determined for each assessment, including quantitation of NK target complexes. Backimmunoscatter gating may be used to track live vs. dead Target cells via scatter properties. If desired, NK activity may then be normalized to standardized ratios for clinical comparisons between patients, making the determination of PBMC counts or NK cell percentages prior to testing unnecessary. This method provides an exact cytometric determination of NK activity that highly reproducible and may be suitable for routine use in the clinical setting.
Author
Cytometry; Toxicity; Immune Systems; Cell Membranes (Biology); Clinical Medicine

20080026339 NASA Johnson Space Center, Houston, TX, USA
Nutritional Status in Self-Neglecting Elderly
Oliver, S. Mathews; Kelly, P. A.; Pickens, S.; Burnett, J.; Dyer, C. B.; Smith, S. M.; April 2006; 1 pp.; In English; Federation of American Societies for Experimental Biology, 1-5 Apr. 2006, San Francisco, CA, USA
Contract(s)/Grant(s): NIH P20-RR020626-02; Copyright; Avail.: Other Sources; Abstract Only

Elder self-neglect is the most common, and most compelling form of elder mistreatment. Individuals who cannot provide the basic needs for themselves may develop social, functional, and physical deficits. The CREST project has the goal of systematically characterizing these individuals, and the objective of the study reported here is to characterize aspects of their nutritional status. Self-neglect (SN) subjects referred from Adult Protective Services were recruited and consented. Control (CN) subjects were matched for age, gender, race, and socio-economic status when possible. Reported here are data on 47 SN subjects (age 77 +/- 7, mean +/- SD; body weight 76 kg +/- 26) and 40 CN subjects (77 +/- 7, 79 kg +/- 20). Blood samples were analyzed for indices of nutritional status. SN subjects had higher serum concentrations of homocysteine ($p < 0.01$) and methylmalonic acid ($p < 0.05$). Red blood cell folate levels were lower ($p < 0.01$) in the SN subjects and serum folate levels tended ($p < 0.07$) to be lower, also. C-reactive protein concentrations were higher than 10 mg/dL in 36% of SN subjects and 18% of CN subjects. Total cholesterol and triglyceride concentrations were similar in the two groups. These data demonstrate that the self-neglecting elderly population is at risk with respect to several markers of nutritional status.
Author
Nutrition; Aging; Geriatrics; Human Behavior; Public Health; Biomarkers

20080029281 NASA Johnson Space Center, Houston, TX, USA

A Preliminary Analysis of Calcifying Particles in the Serum and Prostates of Patients with Prostatic Inflammation

Jones, Jeffrey A.; Carlson, Grant; Kajander, E. Olavi; Warmflash, David; Taylor, Karen; Ayala, Gustavo; Shoskes, Daniel; Everett, Meg; Feedback, Dan; Ciftcioglu, Neva; May 20, 2006; 2 pp.; In English; American Urological Association 2006 Annual Meeting, 20-25 May 2006, Atlanta, GA, USA; Copyright; Avail.: Other Sources; Abstract Only

Chronic diseases of the prostate such as benign prostatic hyperplasia (BPH) & chronic pelvic pain syndrome (CPPS) have associated findings of chronic inflammation, despite a lack of causal relationship. Numerous attempts to define an infectious agent responsible for the clinical findings have been inconsistent. The possibility of an infectious agent, that has not been uncovered with routine culturing methods, forms the basis for this study. Serum from 940 healthy Finnish men were compared with serum from 40 Crohn's, 40 path dx prostatitis, & 40 with path dx carcinoma, using an enzyme-linked immunosorbant assay (ELISA), to detect antigens specific to Nanobacteria(NB) utilizing monoclonal antibodies (Ab) 5/3 and 8D10. This ELISA has not been validated for detecting NB-associated with clinical prostatic disease, yet cross-reactivity with other bacterial species is low. Immunohistochemistry was performed on de-paraffinized prostatic tissue slides, de-calcified with EDTA and stained with the DAKO Catalyzed Signal Amplification kit, employing 8D10 as the primary (target/antigen-detecting) Ab. The mean (plus or minus SD) & median concentrations of NB antigen (U/50 L) were 379.59 (plus or minus 219.28) & 640.00 for patients with prostatitis (BPH) vs 3.31 (plus or minus 3.55) & 2.94 for prostate adenocarcinoma, 1.88 (plus or minus 2.94) & 0.80 for Crohn's disease, & 7.43 (plus or minus 25.57) & 0.00 for patients with no clinical prostatic disease. Unpaired t-tests revealed statistically significant differences between the prostatitis (BPH) sera & each of the other groups with p less than 0.005, but no differences between the other groups themselves. Preliminary studies with immunohistochemistry & 3-D confocal microscopy reveal 16/24 tissue sections + for NB Ag in BPH vs. only 2/22 tissue sections with prostate cancer. The preliminary findings of this serum screening study suggest that NB antigen may be commonly found in the serum of patients with the pathological diagnosis of prostatitis. Preliminary immunohistologic studies, suggest that NB may be found within the gland itself at a higher rate in patients with BPH relative to patients with adenocarcinoma, however confirmatory studies with a more specific ELISA technique, primary cultures, & with larger numbers of patients in a prospective design are required to determine if 1) NB are a causative organism for clinical hyperplastic and inflammatory disease, & if 2) serological testing can be used to discriminate patients with nanobacterial-associated prostatic disease.

Author

Calcification; Patients; Prostate Gland; Diseases; Particles; Serums

20080029287 NASA Johnson Space Center, Houston, TX, USA

Space Life Sciences at NASA: Spaceflight Health Policy and Standards

Davis, Jeffrey R.; House, Nancy G.; June 13, 2006; 3 pp.; In English; 13th Conference on Space Biology and Aerospace Medicine, 13-16 Jun. 2006, Moscow, Russia; No Copyright; Avail.: Other Sources; Abstract Only

In January 2005, the President proposed a new initiative, the Vision for Space Exploration. To accomplish the goals within the vision for space exploration, physicians and researchers at Johnson Space Center are establishing spaceflight health standards. These standards include fitness for duty criteria (FFD), permissible exposure limits (PELs), and permissible outcome limits (POLs). POLs delineate an acceptable maximum decrement or change in a physiological or behavioral parameter, as the result of exposure to the space environment. For example cardiovascular fitness for duty standards might be a measurable clinical parameter minimum that allows successful performance of all required duties. An example of a permissible exposure limit for radiation might be the quantifiable limit of exposure over a given length of time (e.g. life time radiation exposure). An example of a permissible outcome limit might be the length of microgravity exposure that would minimize bone loss. The purpose of spaceflight health standards is to promote operational and vehicle design requirements, aid in medical decision making during space missions, and guide the development of countermeasures. Standards will be based on scientific and clinical evidence including research findings, lessons learned from previous space missions, studies conducted in space analog environments, current standards of medical practices, risk management data, and expert recommendations. To focus the research community on the needs for exploration missions, NASA has developed the Bioastronautics Roadmap. The Bioastronautics Roadmap, NASA's approach to identification of risks to human space flight, revised baseline was released in February 2005. This document was reviewed by the Institute of Medicine in November 2004 and the final report was received in October 2005. The roadmap defines the most important research and operational needs that will be used to set policy, standards (define acceptable risk), and implement an overall Risk Management and Analysis

process. Currently NASA is drafting spaceflight health standards for neurosensory alterations, space radiation exposure, behavioral health, muscle atrophy, cardiovascular fitness, immunological compromise, bone demineralization, and nutrition. Author

Life Sciences; Aerospace Sciences; Bioastronautics; Health Physics; NASA Space Programs; Aerospace Medicine

20080029294 NASA Johnson Space Center, Houston, TX, USA

The USNA MIDN Microdosimeter Instrument

Pisacane, V. L.; Ziegler, J. F.; Nelson, M. E.; Dolecek, Q.; Heyne, J.; Veade, T.; Rosenfeld, A. B.; Cucinotta, F. A.; Zaider, M.; Dicello, J. F.; [2006]; 11 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NCC9-58; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes the MIcroDosimetry iNstrument (MIDN) mission now under development at the USA Naval Academy. The instrument is manifested to fly on the MidSTAR-1 spacecraft, which is the second spacecraft to be developed and launched by the Academy s faculty and midshipmen. Launch is scheduled for 1 September 2006 on an ATLAS-5 launch vehicle. MIDN is a rugged, portable, low power, low mass, solid-state microdosimeter designed to measure in real time the energy distributions of energy deposited by radiation in microscopic volumes. The MIDN microdosimeter sensor is a reverse-biased silicon p-n junction array in a Silicon-On-Insulator (SOI) configuration. Microdosimetric frequency distributions as a function of lineal energies determine the radiation quality factors in support of radiation risk estimation to humans.

Author

Dosimeters; SOI (Semiconductors); Solid State; Real Time Operation; P-N Junctions; Energy Distribution; Silicon Junctions

20080029372 NASA Johnson Space Center, Houston, TX, USA

Inter- and Intra-Chromosomal Aberrations in Human Cells Exposed in vitro to High and Low LET Radiations

Hada, M.; Wilkins, R.; Saganti, P. B.; Gersey, B.; Cucinotta, F. A.; Wu, H.; July 23, 2006; 1 pp.; In English; Committee on Space Research (COSPAR) Colloquium, 23-25 Jul. 2006, Xian, China; No Copyright; Avail.: Other Sources; Abstract Only

Energetic heavy ions pose a health risk to astronauts in extended ISS and future Mars missions. High-LET heavy ions are particularly effective in causing various biological effects including cell inactivation, genetic mutations and cancer induction. Most of these biological endpoints are closely related to chromosomal damage, which can be utilized as a biomarker for radiation insults. Previously, we had studied chromosome aberrations in human lymphocytes and fibroblasts induced by both low- and high-LET radiation using FISH and multicolor fluorescence in situ hybridization (mFISH) techniques. In this study, we exposed human epithelial cells in vitro to gamma rays and energetic particles of varying types and energies and dose rates, and analyzed chromosomal damages using the multicolor banding in situ hybridization (mBAND) procedure. Confluent human epithelial cells (CH184B5F5/M10) were exposed to energetic heavy ions at NASA Space Radiation Laboratory (NSRL) at the Brookhaven National Laboratory, high energy neutron at the Los Alamos Nuclear Science Center (LANSCE) or Cs-137-gamma radiation source at the University of Texas, MD Anderson Cancer Center. After colcemid and Calyculin A treatment, cells were fixed and painted with XCyte3 mBAND kit (MetaSystems) and chromosome aberrations were analyzed with mBAND analysis system (MetaSystems). With this technique, individually painted chromosomal bands on one chromosome allowed the identification of interchromosomal aberrations (translocation to unpainted chromosomes) and intrachromosomal aberrations (inversions and deletions within a single painted chromosome). The results of the mBAND study showed a higher ratio of inversion involved with interchromosomal exchange in heavy ions compared to -ray irradiation. Analysis of chromosome aberrations using mBAND has the potential to provide useful information on human cell response to space-like radiation.

Author

Aberration; In Vitro Methods and Tests; Gamma Rays; Chromosome Aberrations; Cells (Biology); Linear Energy Transfer (LET); Extraterrestrial Radiation; Human Beings

20080029381 NASA Johnson Space Center, Houston, TX, USA

The Influence of Shielding on the Biological Effectiveness of Accelerated Particles for the Induction of Chromosome Damages

Geore, K.; Cucinotta, F. A.; July 16, 2006; 1 pp.; In English; 36th COSPAR Scientific Assembly Meeting, 16-23 Jul. 2006, Beijing, China; Copyright; Avail.: Other Sources; Abstract Only

Chromosome damage was assessed in human peripheral blood lymphocytes after in vitro exposure to the either Si-28 (490

or 600 MeV/n), Ti-48 (1000 MeV/n), or Fe-56 (600, 1000, or 5000 MeV/n). LET values for these ions ranged from approximately 50 to 174 keV/micrometers and doses ranged from 10 to 200 cGy. The effect of either aluminum or polyethylene shielding on the induction of chromosome aberrations was investigated for each ion. Chromosome exchanges were measured using fluorescence in situ hybridization (FISH) with whole chromosome probes in cells collected 48-56 hours after irradiation using a chemical-induced premature chromosome condensation (PCC) technique. The yield of chromosomal aberrations increased linearly with dose and the relative biological effectiveness (RBE) for the primary beams, estimated from the initial slope of the dose response curve for total chromosomal exchanges with respect to gamma-rays, ranged from 14 to 35. The RBE values increased with LET, reaching a maximum for the 1 GeV/n Fe ions with LET of 150 keV/micrometers, and decreased with further increases in LET. When LET of the primary beam was in the region of increasing RBE (i.e. below approximately 100 keV/micrometers), the addition of shielding material increased the effectiveness per unit dose. Whereas shielding decreased the effectiveness per unit dose when the LET of the primary particle beam was higher than 150 keV/micrometers.
Author
Radiation Shielding; Biological Effects; Particle Beams; Ion Irradiation; Chromosome Aberrations; Lymphocytes

20080030127 Department of Justice, Washington, DC, USA
Forensic Applications of Y Chromosome STRs and SNPs
Hammer, M.; Redd, A. J.; Jan. 2006; 51 pp.; In English
Report No.(s): PB2007-112999; No Copyright; Avail.: National Technical Information Service (NTIS)

We identified and characterized 20 novel STRs on the non-recombining portion of the Y chromosome (NRY) that are robust and informative for forensic casework. These Y-STRs,comprised of tetranucleotide, pentanucleotide, and hexanucleotide repeats, greatly improve resolution among paternal lineages above levels obtained with previously used Y-STRs. Multiplex protocols were optimized to amplify 41 Y-STRs in 5 PCR reactions (an additional 2Y-STRs were typed in uniplex assays). A total of 38 Y-STRs was typed in a panel of 2,517 U.S. samples representing African-Americans, European-Americans, Hispanics, Native Americans,and Asian Americans, as well as a large worldwide database. The entire U.S. Y-STR database is available for online searches to estimate frequencies of Y chromosome haplotypes determined from crime scene material. Comparisons of commercially available kits revealed that Applied Biosystems Yfiler, which contains three of our novel Y-STRs, is superior to others. The 11 core Y-STRs recommended by the Scientific Working Group on DNA Analysis Methods the U.S. The analyses support the creation of separate African-American, European-American, Hispanic-American, and Asian-American databases in which samples of the same ethnic group from different geographic regions within the U.S can be pooled. We recommend that separate databases be constructed for different Native American groups. A set of 61 Y chromosome single-nucleotide-polymorphisms (Y-SNPs) was also typed in the U.S. database to infer the geographic origins of Y chromosomes in the U.S. and to test for paternal admixture among U.S.ethnic groups. Admixture estimates vary greatly among populations and ethnic groups. A series of analyses was performed to test for the effects of inter-ethnic admixture on the structure of YSTR diversity in the U.S.
NTIS
Chromosomes; Genetics; Data Bases

20080030263 NASA Johnson Space Center, Houston, TX, USA
Novel Confocal Microscopic and Flow Cytometric Based Assays to Visualize and Detect the (Beta)2-Adrenergic Receptor in Human Lymphocyte and Mononuclear Cell Populations
Salicru, A. N.; Crucian, B. E.; Nelman, M. A.; Sams, C. F.; Actor, J. K.; Marshall, G. D.; May 31, 2006; 1 pp.; In English; 13th Annual PNIRS 2006 Meeting, 31 May - 3 Jun. 2006, Miami, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

The data show that immunophenotyping of leukocyte populations with (beta)2AR is possible with the commercially available Ab, although the FC assay is limited to the IST as a result of the Ab binding site to the intracellular C-terminus of the 2AR. The FC assay has applications for measuring alterations in total (beta)2AR in human leukocyte populations as changes in fluorescence. In addition, CM confirms that both surface and intracellular compartments stain positively for the (beta)2AR and can be used for qualitative assays that screen for changes in receptor compartmentalization and localization.
Author
Cells (Biology); Leukocytes; Lymphocytes; Sympathetic Nervous System; Cytometry; Assaying

20080030379 General Accounting Office, Washington, DC USA

Military Personnel: Better Debt Management Procedures and Resolution of Stipend Recoupment Issues Are Needed for Improved Collection of Medical Education Debts

Farrell, Brenda S; Moser, David; Beale, Rebecca; Cantin, Janine; Harms, Nicole; Richardson, Terry; Weissman, Cheryl; Young, Matthew; Apr 1, 2008; 22 pp.; In English

Report No.(s): AD-A479610; GAO-08-612R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479610

Military physicians and other health care professionals are needed to support operational forces during war or other military conflicts and to maintain the wellbeing of the forces during nonoperational periods. These professionals also provide health care services to military retirees and dependents. The Department of Defense (DOD) acquires its health care professionals primarily through two programs the Armed Forces Health Professions Scholarship Program and the Financial Assistance Program with which it recruits and trains military health care providers who fill medical specialty positions. These programs offer participants reimbursement for tuition, books, fees, other education expenses, and a stipend, which is a fixed amount of money given to the participants on a monthly basis, in return for an active duty service obligation. Recruiting and retaining highly qualified health care professionals, however, is becoming more challenging for each of the military services. The added stresses of repeated deployments and the general perceptions of war, along with the potential for health care providers to earn significantly more money outside of DOD, have caused some professionals to choose to separate themselves from military service, even after DOD has paid for all or part of their medical education. Because DOD medical training programs can take years and are a costly investment, DOD is negatively affected both financially and operationally when individuals do not fulfill their active duty obligations.

DTIC

Costs; Education; Management Methods; Medical Services; Military Operations

20080030380 Pennsylvania Univ., Philadelphia, PA USA

Mutational Analysis of Cell Types in Tuberous Sclerosis Complex (TSC)

Crino, Peter B; Jan 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0168

Report No.(s): AD-A479616; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479616

Tuberous sclerosis complex (TSC) is an autosomal disorder resulting from mutations in the TSC1 or TSC2 genes that is associated with epilepsy cognitive disability and autism. TSC1/TSC2 gene mutations lead to developmental alterations in brain structure known as tubers in over 80% of TSC patients. Loss of TSC1 or TSC2 function in tubers results from biallelic TSC gene inactivation and leads to activation of the mTOR cascade as evidenced by phosphorylation of ribosomal S6 protein (P-S6). We demonstrate that there are numerous cytoarchitectural abnormalities in non-tuber brain areas in post-mortem TSC brain. Many of these regions exhibit aberrant phosphorylation of the ribosomal S6 protein (phospho-S6 or P-S6) a marker for enhanced mTOR signaling. We find P-S6 expression in cortex as well as subcortical regions including the cerebellum. Single cell mutational analysis of these regions reveals somatic missense mutations suggesting that even though these lesions are distinct from tubers they arise by biallelic gene inactivation. We also identify a new marker protein GFAP delta that is co-expressed in tubers and subependymal giant cell tumors.

DTIC

Genes; Mutations; Phosphorylation; Proteins

20080030389 Respiratory Research, Inc., Austin, TX USA

Instrumentation for Monitoring Breath Biomarkers for Diagnosis of Health Condition, Toxic Exposure and Disease

Hunt, John F; Baddour, A R; Dec 2007; 14 pp.; In English

Contract(s)/Grant(s): FA9550-05-C-0188

Report No.(s): AD-A479651; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479651

All goals of this program were reached and are listed below: (1) Improve the efficiency of the Exhaled Breath Condensate collection system when attached to the exhaust port of a ventilator. (2) Implement a gas-standardization methodology for the continuous EBC pH monitoring system that is uniformly reliable, and does not depend on the availability of argon. (3) Assure that the EBC pH measurement system assures error-free removal of accumulated EBC from the pH assay chamber. Implement a simple system for pH probe calibration. (4) Development of the neccessary electronics functionality for the continuous EBC

pH monitoring system to be easily used in the clinical setting for the critical care management of war fighters and civilians.
DTIC
Biomarkers; Diagnosis; Exhaust Systems; Exposure; Health; pH Factor; Toxic Diseases; Toxicity

20080030392 Society for Medical Simulation, Santa Fe, NM USA
2008 International Meeting on Simulation in Healthcare
Gordon, James; May 2008; 42 pp.; In English
Contract(s)/Grant(s): W81XWH-08-1-0020
Report No.(s): AD-A479674; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479674

The 8th International Meeting on Simulation in Healthcare provides an exciting and unique experience for a diverse population of stakeholders who share a common mission to promote excellence in patient care through innovation and collaboration These include: physicians nurses prehospital providers educators engineers technology specialists administrators center operators other clinical providers and non-healthcare simulation enthusiasts Participants will be able to deepen their understanding and application of the latest advances in simulation methods for training and assessment; describe innovations in simulation-based research and development identify the growing opportunities for multi-center collaboration; improve their effectiveness as center operators curriculum and scenario developers learner and program evaluators and researchers and designers The program addresses the spectrum of introductory to advanced topics through a variety of engaging sessions that include keynote and large group presentations interactive workshops expert panel and roundtable discussions affinity group meetings and research abstract presentations Interdisciplinary themes covering broad areas of research education team training and assessment are embedded throughout the conference All simulation methods will be represented including mannequin and computer-based simulators virtual reality systems standardized patients and task trainers.
DTIC
Management Systems; Medical Services; Simulation

20080030393 Naval Postgraduate School, Monterey, CA USA
A Strategic Approach to Humanitarian Medical Manpower Planning
Cooperman, Kathleen K; Houde, Linda J; Mar 2008; 170 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479676; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479676

The demand for soft power tools to positively influence stability and security has increased interest in Humanitarian Medical Assistance. Current medical manpower determination processes for staffing medical missions are based on the Required Operational Capabilities in the Projected Operational Environment. These platforms are designed to support combat casualty, disaster relief, and readiness training. The current manpower process fails to capture country-centric health care requirements associated with peacetime missions. To develop a country-centric approach, a demand-driven manpower model was constructed using standard health statistical indicators. The model draws from the statistical indicators to align medical manpower workload to country health objectives for delivery at the community level. The model framework guides medical planners in identifying mission essential medical programs and services. It shifts manpower planning from scenario based to country capability and needs assessment; which improves alignment to transformational doctrine. Finally, it creates clarity by using actual standard health statistics, thereby fostering prioritization of medical services and improved coordination with stakeholders, such as nongovernmental organizations. It is recommended that a country-centric planning approach be adopted to optimize manpower resources and improve overall operational effectiveness.
DTIC
Manpower; Medical Personnel; Medical Services; Planning

20080030394 Naval Postgraduate School, Monterey, CA USA
Fire Fighters' Ability and Willingness to Participate in a Pandemic
Delaney, Jr, John; Mar 2008; 117 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479677; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479677

Current estimates predict that 30-40 percent of the population will be infected with the flu virus during a pandemic. Fire departments should anticipate a higher attack rate for their personnel because of increased exposure risk. Additionally, many variables will negatively influence fire fighter participation rates over and above these attack rates. This thesis analyzes fire

fighters ability and willingness to participate in a pandemic through a comprehensive survey of fire fighters within the twelve National Capital Region fire departments. Issues that may influence fire fighters ability and willingness to work include childcare, concern of family, adequate personal protective equipment, worker's compensation coverage, and availability of vaccines and antivirals. Collectively, these variables determine a workforce participation percentage (WPP) the share of fire fighters who will be able and willing to participate in a response during a pandemic. Results indicate that between 30-70 percent of the fire fighters will not be able or willing to work during a pandemic. Although a fire fighter s participation is situationally dependent, fire departments should take urgent steps to address five core areas. These are included in a set of recommendations. Ultimately, the priority recommendation is for fire officials and regional public policymakers to rise to the challenge of the complexity of these issues. Leadership in the face of this recognized pandemic threat, however, remains an elusive solution.
DTIC
Drugs; Fire Fighting; Fires; Infectious Diseases; Leadership; Viruses

20080030395 Morehouse School of Medicine, Atlanta, GA USA
The Role & Action of Prohibition, an Antiproliferative Gene, in Ovarian Cancer
Thompson, Winston E; Apr 2007; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0168
Report No.(s): AD-A479678; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479678

The experiments proposed in this application aim at understanding the mechanisms by which prohibitin induces growth arrest in ovarian cancer. We hypothesize that the prohibitin gene product will substantially induce arrest in ovarian cancer cells and enhance differentiation. Accordingly, we will characterize the expression pattern and function of this gene. In specific aim 1, we will define the spatial, temporal and stage specific cellular expression pattern of prohibitin in normal ovary, ovarian tumors of patients with early (FIGO stage 1) and advanced (FIGO stage II-IV) stages of ovarian cancer, using immunohistochemistry, in situ hybridization, Western and Northern blot analyses. In specific aim 2, we will determine whether prohibitin over-expression results in the inhibition of ovarian cancer cell growth, using human ovarian cancer cell lines, OVCAR-3, OVCAR-8, TOV-112D, and OV-90. Lastly, in specific aim 3, we will identify and characterize the expression of variant prohibitin mRNA species in ovarian cancer. Clearly, from a clinical perspective, an understanding of prohibitin gene involvement in ovarian somatic cell growth and differentiation during the normal physiological development as well as its role in the etio-pathogenesis of ovarian tumorigenesis is important. This understanding would lead to development of novel strategies for diagnostic or prognostic therapeutics in the treatment of ovarian cancer and in the design of a more rational basis for drug development.
DTIC
Cancer; Genes; Ovaries; Proteins; Suppressors; Tumors

20080030408 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
Androgen, Estrogen, and the Bone Marrow Microenvironment
Knudsen, Beatrice; Dec 2007; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-0171
Report No.(s): AD-A479729; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479729

In this project we plan to analyze androgen- and estrogen-responsive gene expression in the bone marrow. We plan to work to: determine if castration-induced gene expression changes in mouse bone marrow are caused by the deficiency of testosterone or estrogen; analyze androgen- and estrogen-sensitive cytokine and gene expression changes in human bone marrow transplanted into NOD/SCID mice and; examine androgen- and estrogen-sensitive gene expression in the bone marrow of patients with low and high circulating testosterone levels. Preliminary results show that with the androgen metabolizing genes examined in the bone marrow samples from patients with prostate cancer there is little evidence for a positive correlation between androgen (testosterone) and androgen metabolizing gene expression levels.
DTIC
Bone Marrow; Estrogens; Hormones; Males

20080030410 California Univ., Los Angeles, CA USA

Mechanism of Action of Prostate Stem Cell Antigen Targeted Antibody Therapy and its Relevance to Clinical Application in Prostate Cancer

Reiter, Robert; Tran, Chau; Jan 2008; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0202

Report No.(s): AD-A479732; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479732

We have recently demonstrated that a monoclonal antibody against prostate stem cell antigen (PSCA) can exert anti-tumor activity in a xenograft animal model suggesting oncogenic activity of PSCA in prostate cancer. Therefore the our goal is to elucidate the role of PSCA in the development of prostate cancer. A better understanding of PSCA function and its antibody activity will enable rational patient selection and trial design all of which are particularly relevant to subsequent clinical trials of PSCA antibody. There were difficulties in using the LAPC9 xenograft cells to study the effect of suppressing PSCA but we have since moved ahead to perform an in vivo experiment to study the effect of knocking down PSCA in LAPC9 tumor cells. While the results showed no difference in tumor size we will repeat this experiment this time making sure that PSCA is greatly attenuated before innoculating the tumor cells back into mice. The exciting new data came from the in vitro study of overexpressing PSCA in cell lines. We showed that PSCA promote cell growth in prostate cancer cell line 22RV1 but not in normal cells PZ-HPV7. This results agree with previous data that PSCA is upregulated in prostate cancer. We have also engineered the gene targeting construct to make the human PSCA knockin mice and expect to generate this line in the next 6 month.

DTIC

Antibodies; Antigens; Cancer; Neoplasms; Prostate Gland; Stem Cells; Therapy

20080030411 Mount Sinai Hospital, New York, NY USA

Interferon Antagonism as a Common Virulence Factor of Hemorrhagic Fever Viruses

Sastre, Adolfo G; Schmaljohn, Connie S; Feb 2008; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-2-0028

Report No.(s): AD-A479734; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479734

We examined the ability of viruses in the Hantavirus and Nairovirus genera of the family Bunyaviridae to interfere with host signaling pathways involved in Innate Immunity. For the nairovirus Crimean Congo hemorrhagic fever virus (CCHFV), we found that the viral polymerase gene contains a predicted ovarian tumor (OTU) protease domain that functions to deconjugate ubiquitin and interferon stimulated gene product 15 (ISG15) from host proteins. Both ubiquitin and ISGIS reversibly conjugate to proteins via a conserved LRLRGG C-terminal motif mediating important innate antiviral responses. We showed that the OTU domain-containing proteases of CCHFV hydrolyzes ubiquitin and ISG15 from many cellular target proteins. This broad activity contrasts with the target specificity of known mammalian OTU domain-containing proteins. The biological significance of this activity of viral OTU domain-containing proteases was evidenced by their capacity to inhibit nuclear factor kappa B (NF-KB) dependent signaling and to antagonize the antiviral effects of ISGIS. The deconjugating activity of viral OTU proteases represents a novel viral immune evasion mechanism that inhibits ubiquitin- and ISG15-dependent antiviral pathways. For the hantavirus Hantaan virus (HTNV) we found that the nucleocapsid protein was able to inhibit tumor necrosis factor alpha (TNF-alpha)-induced activation of NF-KB as measured by a reporter assay and activation of endogenous p65 a NF-KB subunit. We showed an interaction between HTNV N protein and importin-o, a nuclear import molecule responsible for shuttling NF-KB to the nucleus. These data suggest that HTNV N protein can sequester NF-KB in the cytoplasm thus inhibiting its activity.

DTIC

Fever; Hemorrhages; Interferon; Virulence; Viruses

20080030412 Jackson (Henry M.) Foundation, Rockville, MD USA

Development of Unique, Leading-Edge, Advanced Medical Research and Development Initiatives in the Western USA and Pacific Rim: Proton Beam Therapy Innovations

Contreras, Thomas J; Jul 2007; 24 pp.; In English

Contract(s)/Grant(s): W81XWH-04-2-0025

Report No.(s): AD-A479735; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479735

Research and development of novel evaluative methods for proton beam radiotherapy is the primary research presented

in this annual report. The long-term objective of this research was to develop a methodology for integrating as well as knowledge discovery of a DICOM-Radiation Therapy electronic patient record (ePR) system to manage patients with most types of Proton Beam Therapy (PT) treatment cases across multiple sites with DOD patients. As a first step, de-identified data samples from patients treated with PT at Loma Linda University Medical Center (LLUMC) was utilized for proof of concept for the research design, implementation, and evaluation. A prototype DICOM-based RT ePR Information System integrating all necessary RT related data and images was designed and presented at a Proton Therapy symposium. The objectives of the research focused on patient cases treated by PT at LLUMC because of the proximity and collaborative efforts between our research laboratory and LLUMC. The success of this proposal has tremendous impact to the US Military healthcare service, specifically in two parts: (1) Integration of clinical data obtained from PT clinical sites with DOD patients that can distributed globally to local peacetime stationary hospitals and clinics of cancer patients for tele-consulation and managed care. (2) Provide an infrastructure to perform large-scale horizontal and longitudinal outcome studies to improve clinical efficacy and efficiency to the patient.
DTIC
Leading Edges; Medical Science; Proton Beams; Radiation Therapy; Therapy; United States

20080030414 California Univ., Los Angeles, CA USA
Reg IV. A Candidate Marker of Hormone Refractory Metastatic Prostate Cancer
Reiter, Robert E; Jan 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0130
Report No.(s): AD-A479740; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479740

In our previous in situ hybridization studies of prostate tissue arrays, ReglV was shown to be strongly expressed by a majority of metastatic hormone refractory tumors (HRPC) and weaker ReglV expression was found in a subset of primary tumors but not expressed by normal tissue. Our goal is to better understand the role of ReglV in prostate cancer progression and to determine its possible use as a diagnostic marker for early and metastatic prostate cancers. We have developed and affinity purified a polyclonal anti-ReglV that has successfully been tested by immunohistochemistry on positive and negative controls. In vitro studies show cells overexpressing ReglV have a growth advantage but not in vivo. However Reg IV knockdown experiment showed that Reg IV may be important in promoting prostate tumor growth during the transition from hormone dependent to hormone refractory status.
DTIC
Cancer; Hormones; Markers; Metastasis; Prostate Gland; Refractories

20080030416 California Univ., Los Angeles, CA USA
UCLA High Speed, High Volume Laboratory Network for Infectious Diseases
Layne, Scott P; Apr 2008; 102 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-2-0015
Report No.(s): AD-A479746; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479746

Background. Government agencies and expert panels have recognized the need for laboratories capable of analyzing tens of thousands of biological samples per day that have hundreds of times more capability than at present. Objectives/Hypothesis. This project aims to develop a new high speed high volume (high-throughput) laboratory capability that will be linked in a network and operated by several premier institutions. The automated networked capability will make us stronger against natural diseases and bioterrorist attacks. Specific Aims. With FY06 (initial year) Congressional appropriations high-throughput bioagent screening and genotyping systems (with quality controls) will be implemented first. These systems will be housed in laboratory space upgraded to BSL3-enhanced (BSL3e) containment that enables the flow of numerous samples containing highly pathologic avian influenza and other select agents (dual-use). With FY07 (available) FY08 (available) and FY 09 (anticipated) Congressional appropriations automated culturing and phenotyping systems will be implemented next. Study Design. Because of current public health and national security threats influenza surveillance and analysis will be the initial focus. Over three years the project will be expanded to include other biothreat agents bacterial and/or viral. Relevance. The combination of high-throughput and automated systems will enable processing of tens of thousands of samples and provide critical laboratory capacity. The overall project will facilitate rapid expansion to multiple networked sites.
DTIC
High Speed; Infectious Diseases; Laboratories; Networks; Standardization

20080030417 Burnham Inst., La Jolla, CA USA

Tumor Suppressor Activity of the EphB2 Receptor in Prostate Cancer

Pasquale, Elena B; Nov 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0077

Report No.(s): AD-A479748; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479748

Mutations have been recently identified in the EphB2 receptor gene in prostate cancer suggesting that EphB2, a member of the large Eph receptor tyrosine kinase family, is a tumor suppressor in prostate cancer. Consistent with a tumor suppressor activity, we found that EphB2 is more highly expressed in non-transformed BPH-1 prostate epithelial cells than in several prostate cancer cell lines. Furthermore, EphB2 expression was rapidly lost in stably transfected DU145 prostate cancer cells, suggesting that EphB2 inhibits cell growth and/or survival. We plan to further examine the effects of EphB2 signaling on the behavior of cancer cells in tissue culture and elucidate the signaling pathways involved. We have also found that other Eph receptors that we detected in prostate cancer cells have tumor suppressor effects similar to EphB2. The information obtained from these studies will help guide the design of appropriate treatment strategies and determine if prostate cancers should be screened for Eph receptor and ephrin ligand expression for prognostic purposes.

DTIC

Cancer; Neoplasms; Prostate Gland; Suppressors; Tumors

20080030418 Texas Univ., Houston, TX USA

Role of Katanin in Prostate Cancer Bone Metastasis

Ye, Xiang-Cang; Jan 2008; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0055

Report No.(s): AD-A479752; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479752

We previously identified katanin p60 as a differentially expressed protein in the bone marrow samples from prostate cancer patients with clinical evidence of bone metastasis. In order to explore the functions of katanin p60 in prostate cancer, we carried out molecular cloning and characterization of katanin p60. From prostate cancer tissues, we cloned three alternative splicing forms in addition to the full-length katanin p60. Two of isoforms showed an effect in modulating cell migration/proliferation in a wound-healing test. Meanwhile, we established stable cell lines and in vitro study systems for future studies. We will continue to characterize the functionalities of katanin p60 and isoforms by use of shRNA to down-regulate the endogenous katanin p60 in prostate cancer cells, so that to compare with those contrastingly over-expressing katanin p60 or isoform. Moreover, as planed in Statement of Work, we will conduct a correlative study of the cellular and tissue distribution of katanin p60 and isoforms in different stages of prostate cancer. Thus, the final outcome of this study will help us to understand the mechanism of katanin-mediated cell activity and to find relevant targets for cancer therapy.

DTIC

Bones; Cancer; Metastasis; Prostate Gland

20080030420 Roswell Park Memorial Inst., Buffalo, NY USA

Identification of Prostate Cancer Related Genes Using Inhibition of NMD in Prostate Cancer Cell Lines. Addendum

Ionov, Yurij; Jan 2008; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0045

Report No.(s): AD-A479756; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479756

A strategy to identify mutant genes using inhibition of nonsense mediated decay (NMD) in cell lines has been proposed by others. Blocking translation with antibiotic emetine has been shown to inhibit the NMD. Stabilization of mutant mRNA following the inhibition of NMD with emetine can be detected using microarray technology, such as Affymetrix genechips, for example. Unfortunately, too many genes that do not contain any mutations show mRNA increase following emetine treatment due to stress response to the inhibition of translation or due to being a natural substrate for NMD, thus complicating the identification of mutant genes. We have developed a modification of the method which includes inhibition of NMD using two alternative methods. First is to inhibit translation with emetine. Second is to block NMD by inhibiting SMG-1 kinase with caffeine and than to block transcription with actinomycin D and either to continue blocking NMD with caffeine or to activate NMD by caffeine withdrawal. Analyzing the mRNA accumulation following emetine treatment as well as mRNA degradation following blocking of transcription in the presence or absence of NMD with the Affymetrix analysis using simple analytical

algorithm allows selection of candidate genes for sequencing with high efficiency. Using our method of NMD inhibition we have identified several genes containing bi-allelic inactivating mutation in prostate cancer cell lines.
DTIC
Antibiotics; Cancer; Genes; Prostate Gland

20080030422 Louisiana State Univ., New Orleans, LA USA
Targeted Eradication of Prostate Cancer Mediated by Engineered Mesenchymal Stem
Cui, Yan; Dec 2007; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0869
Report No.(s): AD-A479778; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479778

This report reviews the third year of research on the diagnostic utility of psychophysiological indict that may predict the current and future functional efficiency of the soldier. The research focuses especially on the measurement of cerebral blood flow velocity (CBFV) using transcranial Doppler sonography (TCD), together with additional indices including salivary cortisol and subjective state. Two studies at the University of Cincinnati demonstrated that CBFV declines during cognitive vigilance and during simulated driving, extending prior results from sensory vigilance tasks. In addition, phase Blood flow responses to a short task battery predicted cognitive vigilance. Predictive validity was increased by including subjective state measures in a multivariate model. Research at Georgia State University, employing simulated military tasks representing sentry duty, peacekeeping operations,and tactical decision making. These studies confirmed that CBFV correlates with various performance indices, indicating that the technique may have diagnostic utility not just for vigilance, but also military decision-making. Attentional skills and eye movement indices were also found to have diagnostic utility. The report concludes with a summary of the main findings from the three years of research, and recommendations for future studies to translate the research into applied techniques for diagnostic monitoring and prediction in military environments.
DTIC
Blood Flow; Brain Circulation; Cancer; Flow Velocity; Gene Therapy; Prostate Gland; Stem Cells

20080030423 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
The Aged Microenvironment Influences Prostate Carcinogenesis
Bianchi-Frias, Daniella; Dec 2007; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0035
Report No.(s): AD-A479779; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479779

The greatest factor for the development of prostate adenocarcinoma is advanced age. Emerging evidence suggests that molecular alterations in the aged prostate microenvironment mediated by stromal aging and senescence are key factors regulating carcinogenesis and neoplastic progression. We used normal mouse prostate epithelial and adjacent stromal cells from young and old animals, microdissected in situ, to identify factors altered by the aged stroma that may place the prostate gland at risk for developing prostate cancer. Expression profiling demonstrated clear differences in gene expression between old and young prostate stroma, with 219 genes exhibiting significant transcript abundance levels ($p<0.005$). Transcripts for Type I and III collagen were among the genes most substantially altered with aging. qRT-PCR confirmed the lower expression of Col1a2 and Col3a1 in the aged prostate stroma and immunofluorescence detection for Type-I collagen revealed a disorganized collagen matrix in the aged prostate. The alterations in the collagen network affect the structural and signaling properties of the extracellular matrix and in turn could plausibly facilitate carcinogenesis and neoplastic progression. The aged-expression profiling also demonstrated the up-regulation of several chemokines (Ccl8, Ccl7), and factors that respond to pro-inflammatory agonist and senescent inducers, such as ApoD in the aged stroma. In summary, the transcriptional profile of the aged prostate microenvironment provides novel data regarding senescence-associated candidate genes important in prostate carcinogenesis. Further studies are necessary in order to provide a functional significance of these alterations with the ultimate goal of supplying strong preclinical data regarding age-associated prostatic stromal factors influencing carcinogenesis that can be translated into novel human studies of prostate cancer prevention.
DTIC
Cancer; Carcinogens; Health; Prostate Gland

20080030578 Georgia Univ., Athens, GA USA

Comparative Genomics and an Insect Model Rapidly Identify Novel Virulence Genes of Burkholderia mallei

Schell, Mark A; Lipscomb, Lyla; DeShazer, David; Apr 2008; 10 pp.; In English

Report No.(s): AD-A479994; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Burkholderia pseudomallei and its host-adapted deletion clone Burkholderia mallei, cause the potentially fatal human diseases melioidosis and glanders, respectively. Their antibiotic resistance profile, ability to infect via aerosol, and the absence of protective vaccines has led to their classification as major biothreats and select agents. Although documented infections by these bacteria date back over 100 years, relatively little is known about their virulence and pathogenicity mechanisms. We used in silico genomic subtraction to generate their virulome, a set of 650 putative virulence-related genes shared by B. pseudomallei and B. mallei, but absent from five closely related nonpathogenic Burkholderia species. Although most of these genes are clustered in putative operons, the number of targets for mutant construction and verification of reduced virulence in animal models is formidable. Therefore, Galleria mellonella (wax moth) larvae were evaluated as a surrogate host; we found that B. pseudomallei and B. mallei, but not other related bacteria, were highly pathogenic in this insect. More importantly, four previously characterized B. mallei mutants with reduced virulence in hamsters or mice were similarly reduced in virulence on G. mellonella larvae. Site-specific inactivation of select genes from the computationally derived virulome identified three potentially new virulence genes, each of which were required for rapid and efficient killing of larvae. Thus, this approach may provide a means to quickly identify high-probability virulence genes in B. pseudomallei, B. mallei, and other pathogens.

DTIC

Bacteria; Genes; Insects; Virulence

20080030581 American Medical Informatics Association, Bethesda, MD USA

American Medical Informatics Association (AMIA) 2007 Annual Symposium

Detmer, Don; Apr 1, 2008; 10 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480000; W81XWH-08-1-0003; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The American Medical Informatics Association (AMIA) is pleased to submit this report to the Telemedicine and Advanced Technologies Research Center (TATRC) which summarizes the TATRC related sessions that were convened during the AMIA 2007 Annual Symposium. AMIA was awarded a partial conference support grant. Two main activities were undertaken: convene an Invitational Expert Panel Meeting to establish a framework for sharing of executable knowledge for computer-based clinical decision support and conduct an advanced briefing for the informatics industry. Each of these is described in greater detail.

DTIC

Clinical Medicine; Conferences; Telemedicine

20080030590 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Complex of a Protective Antibody with its Ebola Virus GP Peptide Epitope: Unusual Features of a V lambda x Light Chain

Lee, Jeffrey E; Kuehne, Ana; Abelson, Dafna M; Fusco, Marnie L; Hart, Mary K; Saphire, Erica O; Oct 2007; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480019; TR-07-058; No Copyright; Avail.: Defense Technical Information Center (DTIC)

13F6-1-2 is a murine monoclonal antibody that recognizes the heavily glycosylated mucin-like domain of the Ebola virus virion-attached glycoprotein (GP) and protects animals against lethal viral challenge. Here we present the crystal structure, at 2.0 , of 13F6-1-2 in complex with its Ebola virus GP peptide epitope. The GP peptide binds in an extended conformation, anchored primarily by interactions to the heavy chain. Two GP residues, Gln P406 and Arg P409, make extensive side-chain H-bond and electrostatic interactions to the antibody and are likely critical for recognition and affinity. The 13F6-1-2 antibody utilizes a rare V lambda(sub x) light chain. Surprisingly, the three CDR light chain loops do not adopt canonical conformations and represent new classes of structures distinct from V kappa and V lambda light chains. The light chain makes five hydrogen bonds to the peptide, but interestingly, all contacts are mediated through germ line-encoded residues. The 13F6-1-2 V lambda (sub x) light chain shares strong sequence identity to human V lambda subgroup VIII, thus providing a framework for humanization. This first structure of a Vx light chain and Ebola virus-neutralizing antibody is an exciting step towards the development of a postexposure therapeutic antibody.

DTIC

Antibodies; Chains; Peptides; Viruses

20080030593 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Tularemia: Current Diagnosis and Treatment Options

Hepburn, Matthew J; Simpson, Andrew J; Apr 2008; 11 pp.; In English

Report No.(s): AD-A480022; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Tularemia is an infection caused by Francisella tularensis with a worldwide distribution and diverse clinical manifestations. Limitations in both culture and serologic testing have led to substantial research into new diagnostic techniques and their clinical application, with PCR testing as the best example. This review focuses on the utility of culture, PCR and serologic testing for tularemia. In addition, we also review the evidence to support different therapeutic options for tularemia, highlighting both the most effective supporting evidence for therapeutic recommendations as well as gaps in current knowledge. We conclude the article with suggestions regarding potential areas for future research.

DTIC

Diagnosis

20080030612 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Treatment of Experimental Anthrax with Recombinant Capsule Depolymerase

Scorpio, Angelo; Tobery, Steven A; Ribot, Wilson J; Friedlander, Arthur M; Dec 2007; 8 pp.; In English

Report No.(s): AD-A480066; USAMRIID-TR-07-017; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bacillus anthracis produces an antiphagocytic gamma-linked poly-D-glutamic acid capsule that is required for virulence. Capsule depolymerase (CapD) is a membrane-associated poly-gamma-glutamate-specific depolymerase encoded on the B. anthracis capsule plasmid, pX02, that is reported to contribute to virulence by anchoring the capsule to the peptidoglycan and partially degrading high molecular weight capsule from the bacterial surface. We previously demonstrated that treatment with CapD effectively removes the capsule from anthrax bacilli, rendering them susceptible to phagocytic killing in vitro. Here we report that CapD promoted in vivo phagocytic killing of B. anthracis bacilli by mouse peritoneal neutrophils and that parenteral administration of CapD protected mice using two models of anthrax infection. CapD conferred significant protection compared with controls when co-injected with encapsulated bacilli from fully virulent B. anthracis Ames or the nontoxigenic encapsulated strain, DeltaAmes and when injected 10 min after infection with encapsulated bacilli from B. anthracis Ames. Protection was also observed when CapD was administered 30 h after infection with B. anthracis DeltaAmes spores while significant protection could not be demonstrated following challenge with B. anthracis Ames spores. These data support the proposed role of capsule in B. anthracis virulence and suggest that strategies to target anthrax bacilli for neutrophil killing may lead to novel postexposure therapies.

DTIC

Bacillus; Infectious Diseases

20080030613 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Vaccine to Confer to Nonhuman Primates Complete Protection Against Multistrain Ebola and Marburg Virus Infections

Swenson, Dana L; Wang, Danher; Luo, Min; Warfield, Kelly L; Wororatanadharm, Jan; Holman, David H; Dong, John Y; Pratt, William D; Jan 2008; 9 pp.; In English

Contract(s)/Grant(s): DAMD17-02-2-0035

Report No.(s): AD-A480067; USAMRIID-TR-07-005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Filoviruses (Ebola and Marburg viruses) are among the deadliest viruses known to mankind with mortality rates nearing 90%. These pathogens are highly infectious through contact with infected body fluids and can be easily aerosolized. Additionally, there are currently no licensed vaccines available to prevent filovirus outbreaks. Their high mortality rates, infectious capabilities when aerosolized, and the lack of licensed vaccines available to prevent such infectious make Ebola and Marburg viruses serious bioterrorism threats, placing them both on the Category A list of bioterrorism agents. Here we describe a pan-filovirus vaccine based on a complex adenovirus (CAdVax) technology that expresses multiple antigens from five different filoviruses de novo. Vaccination of non-human primates demonstrated 100% protection against infection by two species of Ebola virus and three Marburg virus subtypes, each administered at 1000 times the lethal dose. This study indicates the feasibility of vaccination against all current filoviruses threats in the event of natural hemorrhagic fever outbreak or biological attack.

DTIC

Adenoviruses; Fever; Hemorrhages; Infectious Diseases; Primates; Protection; Sudan; Vaccines; Viruses

20080030621 Library of Congress, Washington, DC USA

Federal and State Isolation and Quarantine Authority

Welborn, Angie A; Jan 18, 2005; 12 pp.; In English

Report No.(s): AD-A480093; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the wake of recent terrorist attacks and increasing fears about the spread of highly contagious diseases, such as severe acute respiratory syndrome (SARS), federal, state and local governments have become increasingly aware of the need for an effective public health response to such events. An effective response could include the isolation of persons exposed to infectious biological agents released during an attack or infected with a communicable disease, as well as the quarantine of certain states, cities, or neighborhoods. Currently, state and local governments have the primary authority to control the spread of dangerous diseases within their jurisdiction, with the federal government's role limited to interstate and foreign quarantine. However, many states have inadequate procedures in place for isolating individuals who are infected or believed to be infected and quarantining areas that are or may be infected. Generally, the laws currently in effect do not address the spread of disease resulting from a biological attack, and for the most part only address specific diseases that were the cause of past epidemics, not newly emerging diseases such as SARS. In light of recent events, many states are reevaluating their public health emergency response plans and are expected to enact more comprehensive regulations relating to isolation and quarantine. Public health experts have developed a Model State Emergency Health Powers Act to guide states as they reevaluate their emergency response plans. This report provides an overview of federal and state quarantine laws as they relate to the isolation or quarantine of individuals, as well as a discussion of the relevant case law. The Model State Emergency Health Powers Act is also discussed.

DTIC

Contamination; Isolation; Law (Jurisprudence); Planetary Quarantine; Warfare

20080030626 Army War Coll., Carlisle Barracks, PA USA

DoD-VA Health Care: A Case Study in Interagency Reform

Cho, John M; Mar 10, 2008; 37 pp.; In English

Report No.(s): AD-A480126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent national catastrophes demonstrate that the USA interagency must expand its capacity to expeditiously respond to issues of national importance. Some experts are calling for sweeping interagency reform (IAR) - as reform is often successful when Congress supports and directs legislation born out of calamity. Clearly, there needs to be a better way to improve interagency collaboration than this 'reform after disaster' paradigm. Ideally, interagency coordination absent the need for major IAR legislation is preferable. Examination of the DoD-VA health care partnership in the aftermath of Walter Reed provides new insight into the timing, proportion, and necessity of IAR legislation for improving interagency collaboration. The legacy of this partnership will ultimately depend on its ability to successfully transform ahead of the impending U.S. health care catastrophe. Recommendations are provided to strengthen DoD-VA coordination and build further capacity. The ability of this partnership to mitigate the effects of this imminent national health care crisis will arguably provide the first template for major interagency 'transformation before catastrophe.' Embracing these recommendations also will secure the DoD-VA partnership's position as a model for universal access to health care for all Americans.

DTIC

Health; Management Systems; Medical Services; Military Operations

20080030628 Library of Congress, Washington, DC USA

An Overview of the U.S. Public Health System in the Context of Bioterrorism

Harvey, Holly; Lister, Sarah; Feb 11, 2004; 38 pp.; In English

Report No.(s): AD-A480138; CRS-RL31719; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The anthrax attacks in 2001, along with the events of 9/11, have heightened concern about the nation's ability to respond to bioterrorist attacks. The role of public health in bioterrorism preparedness and response is to plan and coordinate emergency medical and public health response capabilities; to detect, investigate, and identify disease outbreaks using surveillance systems, epidemiology, and laboratory services; to maintain healthy conditions by regulating the environment, food, and water to minimize disease threats; and to communicate rapidly and clearly with response partners, health practitioners, the media, and the public. The capacity to fulfill these responsibilities depends on the strength of the infrastructure that supports the provision of public health services. The public health infrastructure includes the organizations, people, and data systems needed to assure the provision of essential public health services. Public health organizations exist at the federal, state, and local level; they interact with each other, the health care delivery system, public safety providers, private enterprises, and volunteer organizations to provide public health services. Even before 9/11 and the 2001 anthrax attacks, a consensus had

emerged among public health experts that the public health system had deteriorated. A series of studies and reports cited outmoded technology and information systems, insufficient resources to combat emerging and drug-resistant diseases, a public health workforce with inadequate training to address new threats or to adapt to new ways of doing things, poor communication among responsible parties, and inadequate capacity in hospitals and laboratories to respond to a mass casualty event as the major challenges facing public health organizations. Recent congressional action has provided funding and guidance to improve public health capacity at the federal, state, and local levels, but challenges remain in a variety of areas.
DTIC
Medical Services; Public Health; United States

20080030629 Library of Congress, Washington, DC USA
An Overview of the U.S. Public Health System in the Context of Bioterrorism
Harvey, Holly; Jan 17, 2003; 30 pp.; In English
Report No.(s): AD-A480139; CRS-RL31719; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The anthrax attacks in 2001, along with the events of 9/11, have heightened concern about the nation's ability to respond to bioterrorist attacks. The role of public health in bioterrorism preparedness and response is to plan and coordinate emergency medical and public health response capabilities; to detect, investigate, and identify disease outbreaks using surveillance systems, epidemiology, and laboratory services; to maintain healthy conditions by regulating the environment, food, and water to minimize disease threats; and to communicate rapidly and clearly with response partners, health practitioners, the media, and the public. The capacity to fulfill these responsibilities depends on the strength of the infrastructure that supports the provision of public health services. The public health infrastructure includes the organizations, people, and data systems needed to assure the provision of essential public health services. Public health organizations exist at the federal, state, and local level; they interact with each other, the health care delivery system, public safety providers, private enterprises, and volunteer organizations to provide public health services. Even before 9/11 and the 2001 anthrax attacks, a consensus had emerged among public health experts that the public health system had deteriorated. A series of studies and reports cited outmoded technology and information systems, insufficient resources to combat emerging and drug-resistant diseases, a public health workforce with inadequate training to address new threats or to adapt to new ways of doing things, poor communication among responsible parties, and inadequate capacity in hospitals and laboratories to respond to a mass casualty event as the major challenges facing public health organizations. Recent congressional action has provided funding and guidance to improve public health capacity at the federal, state, and local levels, but challenges remain in a variety of areas.
DTIC
Medical Services; Public Health; United States

20080030637 Army War Coll., Carlisle Barracks, PA USA
Cost of War: Can the Department of Defense Afford the Bill
Goldmann, Mae M; Mar 23, 2008; 31 pp.; In English
Report No.(s): AD-A480158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Much has been reported in the news about the cost of the current war in Iraq and Afghanistan. Daily accounts of what Congress has identified in Supplemental funding, how much the Department of Defense has requested, and what actions the President has taken in the process. Supplemental funding has dominated the funding process for the past 5 years and all indications are it will continue into the foreseeable future. The question facing analysts now is how much longer the USA can afford to pay for the short-term requirements and ignore the longer-term costs associated with the short term fix. Specifically, how are current combat operations influencing the Veterans Affairs organizations charged with the long term care of those who serve the nation? What are some of the hidden costs to the War, not covered in Supplemental funds, and are we willing to demand Veterans sacrifice current benefits? This paper will focus on the issues facing Veterans Affairs Hospitals, healthcare for returning Veterans, and effects of continued deployments on Force Structure, specifically members of the Reserve Components.
DTIC
Costs; Defense Program; Health; Medical Services

20080030930 Texas Univ. Health Science Center, Houston, TX, USA; NASA Johnson Space Center, Houston, TX, USA
In vitro Catecholamine Exposure Produces Variable Effects on the B7 Costimulatory Pathway in Human Monocytic Cells
Salicru, A. N.; Crucian, B.; Sams, Clarence; Actor, J. K.; Marshall, G. D., Jr.; May 12, 2006; 1 pp.; In English; Immunology 2006, 12-16 May 2006, Boston, MA, USA; Copyright; Avail.: Other Sources; Abstract Only

Catecholamines have been associated with immunomodulation of the adaptive immune system towards a Th2 response

in vitro. We therefore examined the role of in vitro epinephrine (EPI) and norepinephrine (NE) exposure on the B7 costimulatory expression of antigen presenting cells (APC) from human monocytic cell lines and human peripheral blood mononuclear cells (PBMC). THP1 monocytic cells and CD14+ cells from normal human PBMC were stimulated with lipopolysaccharide (LPS) and incubated with physiologic stress levels (10(exp -6) - 10(exp -8)M) of EPI or NE for 24 hours. Cells were subsequently stained with CD80 FITC, CD86 PE, and CD14 PC5 antibodies and analyzed by flow cytometry for changes in fluorescence and mean fluorescence intensity (MFI). Exposure of THP1 to EPI in vitro at concentrations of 10(exp -6), 10(exp -7) and 10(exp -8)M significantly decreased mean CD80 from 42 plus or minus 0.7% to 11 plus or minus 0.44%, 19.1 plus or minus 2.0%, and 30.7 plus or minus 2.1% expression, respectively (p less than 0.01). In addition, CD86 expression increased with EPI at 10(exp -6), 10(exp -7) and 10(exp -8) M from 9.2 plus or minus 0.52% to 41 plus or minus 3.8%, 26.4 plus or minus 1.9%, and 15.74 plus or minus 1.8% expression, respectively (p less than 0.01). Similar results for mean CD80 and CD86 percent expression were observed for CD14+ cells from PBMC with a sample size of N = 6 and for NE when substituted for EPI. The data show that in vitro exposure to catecholamines significantly decreases %CD86 expression and significantly increases %CD86 expression in THP1 cells and human CD14+ APC. Previous studies have suggested an association between increased CD86 expression and TH2 activity. Thus, these data suggest that immunomodulation by catecholamines results in part by the variable effects of the B7 costimulatory pathway in APC.
Author
Catecholamine; Exposure; In Vitro Methods and Tests; Cells (Biology); Immunology

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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*.

20080026254 NASA Johnson Space Center, Houston, TX, USA
Nutrition for Space Exploration
Smith, Scott M.; January 10, 2005; 2 pp.; In English; Bioastronautics Meeting, 10-12 Jan. 2005, Galveston, TX, USA; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080026254

Nutrition has proven to be critical throughout the history of human exploration, on both land and water. The importance of nutrition during long-duration space exploration is no different. Maintaining optimal nutritional status is critical for all bodily systems, especially in light of the fact that that many are also affected by space flight itself. Major systems of concern are bone, muscle, the cardiovascular system, the immune system, protection against radiation damage, and others. The task ahead includes defining the nutritional requirements for space travelers, ensuring adequacy of the food system, and assessing crew nutritional status before, during, and after flight. Accomplishing these tasks will provide significant contributions to ensuring crew health on long-duration missions. In addition, development and testing of nutritional countermeasures to effects of space flight is required, and assessment of the impact of other countermeasures (such as exercise and pharmaceuticals) on nutrition is also critical for maintaining overall crew health. Vitamin D stores of crew members are routinely low after long-duration space flight. This occurs even when crew members take vitamin D supplements, suggesting that vitamin D metabolism may be altered during space flight. Vitamin D is essential for efficient absorption of calcium, and has numerous other benefits for other tissues with vitamin D receptors. Protein is a macronutrient that requires additional study to define the optimal intake for space travelers. Administration of protein to bed rest subjects can effectively mitigate muscle loss associated with disuse, but too much or too little protein can also have negative effects on bone. In another bed rest study, we found that the ratio of protein to potassium was correlated with the level of bone resorption: the higher the ratio, the more bone resorption. These relationships warrant further study to optimize the beneficial effect of protein on both bone and muscle during space flight. Omega3 fatty acids are currently being studied as a means of protecting against radiation-induced cancer. They have also recently been implicated as having a role in mitigating the physical wasting, or cachexia, caused by cancer. The mechanism of muscle loss associated with this type of cachexia is similar to the mechanism of muscle loss during disuse or space flight. Omega3 fatty acids have already been shown to have protective effects on bone and cardiovascular function. Omega3 fatty acids could be an ideal countermeasure for space flight because they have protective effects on multiple systems. A definition of optimal nutrient intake requirements for long-duration space travel should also include antioxidants. Astronauts are exposed to numerous sources of oxidative stress, including radiation, elevated oxygen exposure during extravehicular activity, and physical and psychological stress. Elevated levels of oxidative damage are related to increased risk for cataracts,

cardiovascular disease, and cancer. Many groundbased studies show the protective effects of antioxidants against oxidative damage induced by radiation or oxygen. Balancing the diet with foods that have high levels of antioxidants would be another ideal countermeasure because it should have minimal side effects on crew health. Antioxidant supplements, however, are often used without having data on their effectiveness or side effects. High doses of supplements have been associated with bone and cardiovascular problems, but research on antioxidant effects during space flight has not been conducted. Much work must be done before we can send crews on exploration missions. Nutrition is often assumed to be the simple provision of food items that will be stable throughout the mission. As outlined briefly above, the situation is much more complex than food provision. As explorers throughout history have found, failure to truly understand the role of nutrition can be catastrophic. When huns are in environments unlike any they have seen before, this is more true than ever.
Author
Nutrition; Space Exploration; Aerospace Medicine; Manned Space Flight

20080026296 NASA Johnson Space Center, Houston, TX, USA
Tilt and Translation Motion Perception during Pitch Tilt with Visual Surround Translation
O'Sullivan, Brita M.; Harm, Deborah L.; Reschke, Millard F.; Wood, Scott J.; June 07, 2006; 2 pp.; In English; Seventh Symposium on the ROle of the Vestibular, 11-14 Jun, 2006, Noordwijk, Netherlands
Contract(s)/Grant(s): NNC9-58; No Copyright; Avail.: Other Sources; Abstract Only

The central nervous system must resolve the ambiguity of inertial motion sensory cues in order to derive an accurate representation of spatial orientation. Previous studies suggest that multisensory integration is critical for discriminating linear accelerations arising from tilt and translation head motion. Visual input is especially important at low frequencies where canal input is declining. The NASA Tilt Translation Device (TTD) was designed to recreate postflight orientation disturbances by exposing subjects to matching tilt self motion with conflicting visual surround translation. Previous studies have demonstrated that brief exposures to pitch tilt with foreaft visual surround translation produced changes in compensatory vertical eye movement responses, postural equilibrium, and motion sickness symptoms. Adaptation appeared greatest with visual scene motion leading (versus lagging) the tilt motion, and the adaptation time constant appeared to be approximately 30 min. The purpose of this study was to compare motion perception when the visual surround translation was inphase versus outofphase with pitch tilt. The inphase stimulus presented visual surround motion one would experience if the linear acceleration was due to foreaft self translation within a stationary surround, while the outofphase stimulus had the visual scene motion leading the tilt by 90 deg as previously used. The tilt stimuli in these conditions were asymmetrical, ranging from an upright orientation to 10 deg pitch back. Another objective of the study was to compare motion perception with the inphase stimulus when the tilts were asymmetrical relative to upright (0 to 10 deg back) versus symmetrical (10 deg forward to 10 deg back). Twelve subjects (6M, 6F, 22-55 yrs) were tested during 3 sessions separated by at least one week. During each of the three sessions (out-of-phase asymmetrical, in-phase asymmetrical, inphase symmetrical), subjects were exposed to visual surround translation synchronized with pitch tilt at 0.1 Hz for a total of 30 min. Tilt and translation motion perception was obtained from verbal reports and a joystick mounted on a linear stage. Horizontal vergence and vertical eye movements were obtained with a binocular video system. Responses were also obtained during darkness before and following 15 min and 30 min of visual surround translation. Each of the three stimulus conditions involving visual surround translation elicited a significantly reduced sense of perceived tilt and strong linear vection (perceived translation) compared to pre-exposure tilt stimuli in darkness. This increase in perceived translation with reduction in tilt perception was also present in darkness following 15 and 30 min exposures, provided the tilt stimuli were not interrupted. Although not significant, there was a trend for the inphase asymmetrical stimulus to elicit a stronger sense of both translation and tilt than the out-of-phase asymmetrical stimulus. Surprisingly, the inphase asymmetrical stimulus also tended to elicit a stronger sense of peak-to-peak translation than the inphase symmetrical stimulus, even though the range of linear acceleration during the symmetrical stimulus was twice that of the asymmetrical stimulus. These results are consistent with the hypothesis that the central nervous system resolves the ambiguity of inertial motion sensory cues by integrating inputs from visual, vestibular, and somatosensory systems.
Author
Motion Perception; Attitude (Inclination); Sensory Perception; Translational Motion; Pitch (Inclination); Visual Perception

20080026304 NASA Johnson Space Center, Houston, TX, USA
Predictions of Leukemia Risks to Astronauts from Solar Particle Events
Cucinotta, F. A.; Atwell, W.; Kim, M. Y.; George, K. A.; Ponomarev, A.; Nikjoo, H.; Wilson, J. W.; June 06, 2006; 1 pp.; In English; 4th International Workshop on Space Radiation, 3010 Jun. 2006, Moscow, Russia; Copyright; Avail.: Other Sources; Abstract Only

Leukemias consisting of acute and chronic myeloid leukemia and acute lymphatic lymphomas represent the earliest

cancers that appear after radiation exposure, have a high lethality fraction, and make up a significant fraction of the overall fatal cancer risk from radiation for adults. Several considerations impact the recommendation of a preferred model for the estimation of leukemia risks from solar particle events (SPE's): The BEIR VII report recommends several changes to the method of calculation of leukemia risk compared to the methods recommended by the NCRP Report No. 132 including the preference of a mixture model with additive and multiplicative components in BEIR VII compared to the additive transfer model recommended by NCRP Report No. 132. Proton fluences and doses vary considerably across marrow regions because of the characteristic spectra of primary solar protons making the use of an average dose suspect. Previous estimates of bone marrow doses from SPE's have used an average body-shielding distribution for marrow based on the computerized anatomical man model (CAM). We have developed an 82-point body-shielding distribution that faithfully reproduces the mean and variance of SPE doses in the active marrow regions (head and neck, chest, abdomen, pelvis and thighs) allowing for more accurate estimation of linear- and quadratic-dose components of the marrow response. SPE's have differential dose-rates and a pseudo-quadratic dose response term is possible in the peak-flux period of an event. Also, the mechanistic basis for leukemia risk continues to improve allowing for improved strategies in choosing dose-rate modulation factors and radiation quality descriptors. We make comparisons of the various choices of the components in leukemia risk estimates in formulating our preferred model. A major finding is that leukemia could be the dominant risk to astronauts for a major solar particle event. Author

Manned Space Flight; Risk Assessment; Solar Flares; Radiation Dosage; Leukemias; Aerospace Medicine; Radiation Effects; Biological Effects

20080026306 NASA Johnson Space Center, Houston, TX, USA

Medical Operations Console Procedure Evaluation: BME Response to Crew Call Down for an Emergency

Johnson-Troop; Pettys, Marianne; Hurst, Victor, IV; Smaka, Todd; Paul, Bonnie; Rosenquist, Kevin; Gast, Karin; Gillis, David; McCulley, Phyllis; May 26, 2006; 2 pp.; In English; Human Factors and Ergonomics Society Meeting, 26 May 2006, Houston, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

International Space Station (ISS) Mission Operations are managed by multiple flight control disciplines located at the lead Mission Control Center (MCC) at NASA-Johnson Space Center (JSC). ISS Medical Operations are supported by the complementary roles of Flight Surgeons (Surgeon) and Biomedical Engineer (BME) flight controllers. The Surgeon, a board certified physician, oversees all medical concerns of the crew and the BME provides operational and engineering support for Medical Operations Crew Health Care System. ISS Medical Operations is currently addressing the coordinated response to a crew call down for an emergent medical event, in particular when the BME is the only Medical Operations representative in MCC. In this case, the console procedure BME Response to Crew Call Down for an Emergency will be used. The procedure instructs the BME to contact a Surgeon as soon as possible, coordinate with other flight disciplines to establish a Private Medical Conference (PMC) for the crew and Surgeon, gather information from the crew if time permits, and provide Surgeon with pertinent console resources. It is paramount that this procedure is clearly written and easily navigated to assist the BME to respond consistently and efficiently. A total of five BME flight controllers participated in the study. Each BME participant sat in a simulated MCC environment at a console configured with resources specific to the BME MCC console and was presented with two scripted emergency call downs from an ISS crew member. Each participant used the procedure while interacting with analog MCC disciplines to respond to the crew call down. Audio and video recordings of the simulations were analyzed and each BME participant's actions were compared to the procedure. Structured debriefs were conducted at the conclusion of both simulations. The procedure was evaluated for its ability to elicit consistent responses from each BME participant. Trials were examined for deviations in procedure task completion and/or navigation, in particular the execution of the Surgeon call sequence. Debrief comments were used to analyze unclear procedural steps and to discern any discrepancies between the procedure and generally accepted BME actions. The sequence followed by BME participants differed considerably from the sequence intended by the procedure. Common deviations included the call sequence used to contact Surgeon, the content of BME and crew interaction and the gathering of pertinent console resources. Differing perceptions of task priority and imprecise language seem to have caused multiple deviations from the procedure s intended sequence. The study generated 40 recommendations for the procedure, of which 34 are being implemented. These recommendations address improving the clarity of the instructions, identifying training considerations, expediting Surgeon contact, improving cues for anticipated flight control team communication and identifying missing console tools. Author

Aerospace Medicine; Medical Services; Flight Operations; Manned Space Flight; Health; Mission Planning

20080026350 NASA Johnson Space Center, Houston, TX, USA

Proteomic Retrieval from Nucleic Acid Depleted Space-Flown Human Cells

Hammond, D. K.; Elliott, T. F.; Holubec, K.; Baker, T. L.; Allen, P. L.; Hammond, T. G.; Love, J. E.; [2006]; 2 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS9-02078; NAG8-1362; Copyright; Avail.: CASI: A01, Hardcopy

Compared to experiments utilizing humans in microgravity, cell-based approaches to questions about subsystems of the human system afford multiple advantages, such as crew safety and the ability to achieve statistical significance. To maximize the science return from flight samples, an optimized method was developed to recover protein from samples depleted of nucleic acid. This technique allows multiple analyses on a single cellular sample and when applied to future cellular investigations could accelerate solutions to significant biomedical barriers to human space exploration. Cell cultures grown in American Fluoroseal bags were treated with an RNA stabilizing agent (RNAlater - Ambion), which enabled both RNA and immunoreactive protein analyses. RNA was purified using an RNAqueous(registered TradeMark) kit (Ambion) and the remaining RNA free supernatant was precipitated with 5% trichloroacetic acid. The precipitate was dissolved in SDS running buffer and tested for protein content using a bicinchoninic acid assay (1) (Sigma). Equal loads of protein were placed on SDS-PAGE gels and either stained with CyproOrange (Amersham) or transferred using Western Blotting techniques (2,3,4). Protein recovered from RNAlater-treated cells and stained with protein stain, was measured using Imagequant volume measurements for rectangles of equal size. BSA treated in this way gave quantitative data over the protein range used (Fig 1). Human renal cortical epithelial (HRCE) cells (5,6,7) grown onboard the International Space Station (ISS) during Increment 3 and in ground control cultures exhibited similar immunoreactivity profiles for antibodies to the Vitamin D receptor (VDR) (Fig 2), the beta isoform of protein kinase C (PKC) (Fig 3), and glyceraldehyde-3-phosphate dehydrogenase (GAPDH) (Fig 4). Parallel immunohistochemical studies on formalin-fixed flight and ground control cultures also showed positive immunostaining for VDR and other biomarkers (Fig 5). These results are consistent with data from additional antigenic recovery experiments performed on human Mullerian tumor cells cultured in microgravity (8).

Author

Cells (Biology); Spaceborne Experiments; Proteome; International Space Station; Microgravity; Nucleic Acids; Cultured Cells; Antibodies

20080029277

Bragg Curve, Biological Bragg Curve and Biological Issues in Space Radiation Protection with Shielding

July 23, 2006; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

The space environment consists of a varying field of radiation particles including high-energy ions, with spacecraft shielding material providing the major protection to astronauts from harmful exposure. Unlike low-LET gamma or X-rays, the presence of shielding does not always reduce the radiation risks for energetic charged particle exposure. Since the dose delivered by the charged particle increases sharply as the particle approaches the end of its range, a position known as the Bragg peak, the Bragg curve does not necessarily represent the biological damage along the particle traversal since biological effects are influenced by the track structure of both primary and secondary particles. Therefore, the biological Bragg curve is dependent on the energy and the type of the primary particle, and may vary for different biological endpoints. To achieve a Bragg curve distribution, we exposed cells to energetic heavy ions with the beam geometry parallel to a monolayer of fibroblasts. Qualitative analyses of gamma-H2AX fluorescence, a known marker of DSBs, indicated increased clustering of DNA damage before the Bragg peak, enhanced homogenous distribution at the peak, and provided visual evidence of high linear energy transfer (LET) particle traversal of cells beyond the Bragg peak. A quantitative biological response curve generated for micronuclei (MN) induction across the Bragg curve did not reveal an increased yield of MN at the location of the Bragg peak. However, the ratio of mono-to bi-nucleated cells, which indicates inhibition in cell progression, increased at the Bragg peak location. These results, along with other biological concerns, show that space radiation protection with shielding can be a complicated issue.

Author

Bragg Curve; Extraterrestrial Radiation; Radiation Shielding; Radiation Dosage; Biological Effects; Radiation Protection; Fibroblasts; Deoxyribonucleic Acid; Radiation Damage; Bioastronautics

20080029378 NASA Johnson Space Center, Houston, TX, USA

Adaptive Changes In Postural Equilibrium And Motion Sickness Following Repeated Exposures To Virtual Environments

Harm, D. L.; Taylor, L. C.; June 11, 2006; 2 pp.; In English; Seventh Symposium on the Role of the Vestibular Organs in Space Exploration, 11-14 Jun. 2006, Noordwijk, Netherlands; No Copyright; Avail.: Other Sources; Abstract Only

Virtual environments offer unique training opportunities, particularly for training astronauts and preadapting them to the

novel sensory conditions of microgravity. Two unresolved human factors issues in virtual reality (VR) systems are: 1) potential 'cybersickness', and 2) maladaptive sensorimotor performance following exposure to VR systems. Interestingly, these aftereffects are often quite similar to adaptive sensorimotor responses observed in astronauts during and/or following space flight. Changes in the environmental sensory stimulus conditions and the way we interact with the new stimuli may result in motion sickness, and perceptual, spatial orientation and sensorimotor disturbances. Initial interpretation of novel sensory information may be inappropriate and result in perceptual errors. Active exploratory behavior in a new environment, with resulting feedback and the formation of new associations between sensory inputs and response outputs, promotes appropriate perception and motor control in the new environment. Thus, people adapt to consistent, sustained alterations of sensory input such as those produced by microgravity, unilateral labyrinthectomy and experimentally produced stimulus rearrangements. Adaptation is revealed by aftereffects including perceptual disturbances and sensorimotor control disturbances. The purpose of the current study was to compare disturbances in postural control produced by dome and head-mounted virtual environment displays, and to examine the effects of exposure duration, and repeated exposures to VR systems. Forty-one subjects (21 men, 20 women) participated in the study with an age range of 21-49 years old. One training session was completed in order to achieve stable performance on the posture and VR tasks before participating in the experimental sessions. Three experimental sessions were performed each separated by one day. The subjects performed a navigation and pick and place task in either a dome or head-mounted display (HMD) VR system for either 30 or 60 min. The environment was a square room with 15 pedestals on two opposite walls. The objects appeared on one set of pedestals and the subject s objective was to move the objects to the other set of pedestals. After the subject picked up an object, a pathway appeared and they were required to follow the pathway to the other side of the room. The subject was instructed to perform the task as quickly and accurately as possible, avoiding hitting walls and other any obstacles and placing the object on the center of the pedestal. Postural equilibrium was measured (using the Equitest CDP balance system, Neurocom, International) before, immediately after, and at 1 hr, 2 hr, 4 hr and 6 hr following exposure to VR. Postural equilibrium was measured during quiet stance with eyes open, eyes closed and vision and/or ankle proprioceptive inputs selectively altered by servo-controlling the visual surround and/or support surface to the subject s center of mass sway. Posture data was normalized using a log transformation and motion sickness data were normalized using the square root. In general, we found that exposure to VR resulted in decrements in postural stability. The largest decrements were observed in the tests performed immediately following exposure to VR and showed a fairly rapid recovery across the remaining test sessions. In addition, subjects generally showed improvement across days. We found significant main effects for day and time for the composite equilibrium score and for sensory organization tests (SOT) 1, 2 and 6. Significant main effects were observed for day for SOT 3 and 5. Although we found no significant main effects for gender (when center of gravity was used as a covariate), we did observe significant gender X time interaction effects for composite equilibrium and for SOT 1, 3, 4 and 5. Women appeared to show larger decrements in postural stability immediately after exposure to VR than men, but recover more quickly than n. Finally, we found no significant main effects for type of VR device or for exposure duration, however, these factors did interact with other factors during some of the SOTs. Subjects exhibited rapid recovery of motion sickness symptoms across time following exposure to VR and significantly less severe symptoms across days. We did not observe main effects for gender, type of device or duration of exposure. Individuals recovered from the detrimental effects of exposure to virtual reality on postural control and motion sickness within one hour. Sickness severity and initial decrements in postural equilibrium decreases over days, which suggests that subjects become dual-adapted over time. These findings provide some direction for developing training schedules for VR users that facilitate adaptation, and support the idea that preflight training of astronauts may serve as useful countermeasure for the sensorimotor effects of space flight.

Author

Exposure; Motion Sickness; Posture; Human Factors Engineering; Microgravity; Sensorimotor Performance; Aerospace Medicine; Virtual Reality

20080029379 NASA Johnson Space Center, Houston, TX, USA

Development of a Countermeasure to Mitigate Postflight Locomotor Dysfunction

Bloomberg, J. J.; Mulavara, A. P.; Peters, B. T.; Cohen, H. S.; Richards, J. T.; Miller, C. A.; Brady, R.; Warren, L. E.; Ruttley, T. M.; June 22, 2008; 2 pp.; In English; Seventh Symposium on the Role of the Vestibular Organs in Space Exploration, 7-9 Jun. 2006, Noordwijk, Netherlands; Copyright; Avail.: Other Sources; Abstract Only

Astronauts returning from space flight experience locomotor dysfunction following their return to Earth. Our laboratory is currently developing a gait adaptability training program that is designed to facilitate recovery of locomotor function following a return to a gravitational environment. The training program exploits the ability of the sensorimotor system to generalize from exposure to multiple adaptive challenges during training so that the gait control system essentially learns to learn and therefore can reorganize more rapidly when faced with a novel adaptive challenge. Evidence for the potential

efficacy of an adaptive generalization gait training program can be obtained from numerous studies in the motor learning literature which have demonstrated that systematically varying the conditions of training enhances the ability of the performer to learn and retain a novel motor task. These variable practice training approaches have been used in applied contexts to improve motor skills required in a number of different sports. The central nervous system (CNS) can produce voluntary movement in an almost infinite number of ways. For example, locomotion can be achieved with many different combinations of joint angles, muscle activation patterns and forces. The CNS can exploit these degrees of freedom to enhance motor response adaptability during periods of adaptive flux like that encountered during a change in gravitational environment. Ultimately, the functional goal of an adaptive generalization countermeasure is not necessarily to immediately return movement patterns back to normal. Rather the training regimen should facilitate the reorganization of available sensory and motor subsystems to achieve safe and effective locomotion as soon as possible after long duration space flight. Indeed, this approach has been proposed as a basic feature underlying effective neurological rehabilitation. We have previously confirmed that subjects participating in an adaptive generalization training program using a variety of visuomotor distortions and throwing as the dependent measure can learn to enhance their ability to adapt to a novel sensorimotor environment (Roller et al., 2001). Importantly, this increased adaptability was retained even one month after completion of the training period. Adaptive generalization has been observed in a variety of other tasks requiring sensorimotor transformations including manual control tasks and reaching (Bock et al., 2001, Seidler, 2003) and obstacle avoidance during walking (Lam and Dietz, 2004). Taken together, the evidence suggests that a training regimen exposing crewmembers to variation in locomotor conditions, with repeated transitions among states, may enhance their ability to learn how to reassemble appropriate locomotor patterns upon return from microgravity. We believe exposure to this type of training will extend crewmembers locomotor behavioral repertoires, facilitating the return of functional mobility after long duration space flight. In other words, our proposed training protocol will compel subjects to develop new behavioral solutions under varying sensorimotor demands. Over time subjects will learn to create appropriate locomotor solution more rapidly enabling acquisition of mobility sooner after long-duration space flight. A gait adaptability training program can be superimposed on nominal treadmill exercise activities thus ensuring that no additional crew time is required to perform this type of training regimen and that it can be implemented with current in-flight exercise systems available on the International Space Station.
Author (revised)
Astronaut Locomotion; Microgravity; Muscular Function; Neurology; Gait; Sensorimotor Performance

20080029380 NASA Johnson Space Center, Houston, TX, USA
Development of Testing Methodologies to Evaluate Postflight Locomotor Performance
Mulavara, A. P.; Peters, B. T.; Cohen, H. S.; Richards, J. T.; Miller, C. A.; Brady, R.; Warren, L. E.; Bloomberg, J. J.; June 07, 2006; 2 pp.; In English; Seventh Symposium on the Role of the Vestibular Organs in Space Exploration, 7-9 Jun. 2006, Noordwijk, Netherlands
Contract(s)/Grant(s): NCC9-58; Copyright; Avail.: Other Sources; Abstract Only

Crewmembers experience locomotor and postural instabilities during ambulation on Earth following their return from space flight. Gait training programs designed to facilitate recovery of locomotor function following a transition to a gravitational environment need to be accompanied by relevant assessment methodologies to evaluate their efficacy. The goal of this paper is to demonstrate the operational validity of two tests of locomotor function that were used to evaluate performance after long duration space flight missions on the International Space Station (ISS).
Derived from text
Gait; Methodology; Spacecrews; Locomotion; Astronaut Locomotion

20080029395 NASA Johnson Space Center, Houston, TX, USA
The Effect of a Mars Mission on Chromosome Damage in the Blood Lymphocytes of Astronauts
George, Kerry A.; Durante, M.; Cucinnotta, F. A.; June 03, 2006; 1 pp.; In English; IWSRR Workshop, 3-11 Jun. 2006, Moscow, Russia; Copyright; Avail.: Other Sources; Abstract Only

The radiation environment encountered during a manned mission to Mars will lead to significant elevation of biological damage in astronauts. Here we present estimates of the increased frequencies of chromosome aberrations in the peripheral blood lymphocytes of astronauts after a hypothetical Mars mission using radiation dose estimations and lymphocyte biology. Results will incorporate previously published data on in vivo induced chromosome damage in the blood lymphocytes of crewmembers after ISS and Mir missions, along with recent findings on the time dependant decay of chromosome aberrations after space flight.
Author
Manned Mars Missions; Chromosome Aberrations; Radiation Dosage; Lymphocytes

20080029397 NASA Johnson Space Center, Houston, TX, USA
NASA - Human Space Flight
Davis, Jeffrey R.; March 29, 2006; 1 pp.; In English; NASA - Human Space Flight, 29 Mar. 2006, Fresno, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The presentation covers five main topical areas. The first is a description of how things work in the microgravity environment such as convection and sedimentation. The second part describes the effects of microgravity on human physiology. This is followed by a description of the hazards of space flight including the environment, the space craft, and the mission. An overview of biomedical research in space, both on shuttle and ISS is the fourth section of the presentation. The presentation concludes with a history of space flight from Ham to ISS. At CART students (11th and 12th graders from Fresno Unified and Clovis Unified) are actively involved in their education. They work in teams to research real world problems and discover original solutions. Students work on projects guided by academic instructors and business partners. They will have access to the latest technology and will be expected to expand their learning environment to include the community. They will focus their studies around a career area (Professional Sciences, Advanced Communications, Engineering and Product Development, or Global Issues).
Author
Manned Space Flight; NASA Space Programs; Microgravity; General Overviews; Aerospace Medicine

20080029399 NASA Johnson Space Center, Houston, TX, USA
Aerospace Medicine
Davis, Jeffrey R.; April 14, 2006; 1 pp.; In English; Ground Rounds, 14 Apr. 2006, New York, NY, USA; No Copyright; Avail.: Other Sources; Abstract Only

This abstract describes the content of a presentation for ground rounds at Mt. Sinai School of Medicine. The presentation contains three sections. The first describes the history of aerospace medicine beginning with early flights with animals. The second section of the presentation describes current programs and planning for future missions. The third section describes the medical challenges of exploration missions.
Author
Aerospace Medicine; Mission Planning; Manned Space Flight; Bioastronautics

20080029986 Massachusetts Univ. Medical Center, Worcester, MA, USA; NASA Johnson Space Center, Houston, TX, USA
Validation of a New NIRS Method for Measuring Muscle Oxygenation During Rhythmic Handgrip Exercise
Hagan, R. Donald; Soller, Babs R.; Soyemi, Olusola; Landry, Michelle; Shear, Michael; Wu, Jacqueline; May 30, 2006; 1 pp.; In English; American College of Sports Medicine Meeting, 30 May - 4 Jun. 2006, Denver, CO, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NCC9-58; Copyright; Avail.: CASI: A01, Hardcopy

Near infrared spectroscopy (NIRS) is commonly used to measure muscle oxygenation during exercise and recovery. Current NIRS algorithms do not account for variation in water content and optical pathlength during exercise. The current effort attempts to validate a newly developed NIRS algorithm during rhythmic handgrip exercise and recovery. Six female subjects, aver age 28 +/- 6 yrs, participated in the study. A venous catheter was placed in the retrograde direction in the antecubital space. A NIRS sensor with 30 mm source-detector separation was placed on the flexor digitorum profundus. Subjects performed two 5-min bouts of rhythmic handgrip exercise (2 s contraction/1 s relaxation) at 15% and 30% of maximal voluntary contraction. Venous blood was sampled before each bout, during the last minute of exercise, and after 5 minutes of recovery. Venous oxygen saturation (SvO2) was measured with a I-stat CG-4+ cartridge. Spectra were collected between 700-900 nm. A modified Beer's Law formula was used to calculate the absolute concentration of oxyhemoglobin (HbO2), deoxyhemoglobin (Hb) and water, as well as effective pathlength for each spectrum. Muscle oxygen saturation (SmO2) was calculated from the HbO2 and Hb results. The correlation between SvO2 and SmO2 was determined. Optical pathlength and water varied significantly during each exercise bout, with pathlength increasing approximately 20% and water increasing about 2%. R2 between blood and muscle SO2 was found to be 0.74, the figure shows the relationship over SvO2 values between 22% and 82%. The NIRS measurement was, on average, 6% lower than the blood measurement. It was concluded that pathlength changes during exercise because muscle contraction causes variation in optical scattering. Water concentration also changes, but only slightly. A new NIRS algorithm which accounts for exercise-induced variation in water and pathlength provided an accurate assessment of muscle oxygen saturation before, during and after exercise.
Author
Infrared Spectroscopy; Muscles; Oxygenation; Hand (Anatomy); Physical Exercise; Physiology

20080030404 Army War Coll., Carlisle Barracks, PA USA
Post-Deployment Memorial Ceremony: A Vital Link
Stice, Kenneth; Mar 25, 2008; 41 pp.; In English
Report No.(s): AD-A479715; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479715

The Army continues to transform into a modular expeditionary force during an era of persistent conflict. The Army readiness and force generation model (ARFORGEN) cycles units through predictable stages for availability to deploy. The Army recognizes the stress of frequent deployments on Soldiers. The Army has committed to care for Soldiers and families. Combat casualties are the greatest challenge that Soldiers, families, units and communities face with unit deployments. Connections between Soldiers, families, units, and communities may be maintained through the deployment cycle of units. These connections support unit cohesion and Soldier resiliency. Casualty response operations manage Army care to Soldiers and families. Research indicates that grief is cumulative. Additional research indicates that Soldiers benefit from communal grieving in unit memorial ceremonies. Rear detachment memorial ceremonies bolster connections between Soldiers, families, and community members at home station. Soldiers that do not adequately grieve for each combat casualty run the risk of psychological stress and possible post traumatic stress disorder (PTSD). Postdeployment memorial ceremonies provide the final link to connect Soldiers, families, units, and communities.
DTIC
Casualties; Deployment; Military Personnel

20080030952 NASA Johnson Space Center, Houston, TX, USA; Wyle Labs., Inc., Houston, TX, USA
Head Tilt Posturography to Enhance Balance Control Assessment for Astronauts: A Case Study
Hwang, E. Y.; Paloski, W. H.; June 07, 2006; 2 pp.; In English; Seventh Symposoium on The Role of the Vestibular Ograns in Space Exploration, 7-9 Jun. 2006, Noordwijk, Netherlands; Copyright; Avail.: CASI: A01, Hardcopy

For many years, we have used a standard clinical computerized dynamic posturography (CDP) protocol to assess recovery of integrated sensory-motor function in astronauts returning from space flight. The most reliable indications of postflight crew performance capabilities have been obtained from the sensory organization tests (SOTs) within the CDP protocol, particularly SOTs 5 (eyes closed, surface support sway referenced) and 6 (eyes open, surface support and visual surround sway referenced), which are sensitive to changes in availability and/or utilization of vestibular cues. We have observed, however, that some astronauts exhibiting visible signs of incomplete sensory-motor recovery are able to score within clinical norms on standard SOTs 5 and 6 trials, perhaps as a result of cognitive strategies driven by their naturally competitive natures. To improve the sensitivity of the CDP protocol for assessing recovery of integrated sensory-motor function and fitness to return to duties and/or activities of daily living, we have introduced pitch plane head tilt SOT trials to our protocol. In a preliminary study of 5 short duration (~11day missions) astronauts, we showed that they were unable to maintain balance on landing day when performing dynamic head tilt trials, despite scoring within the clinically normal range on the standard SOT trials. The present case report illustrates the advantages of including head tilt trials for assessing sensory-motor recovery in long duration crewmembers.
Author
Astronauts; Sensorimotor Performance; Posture

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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*.

20080026279 NASA Johnson Space Center, Houston, TX, USA
Tools to Support Human Factors and Systems Engineering Interactions During Early Analysis
Thronesbery, Carroll; Malin, Jane T.; Holden, Kritina; Smith, Danielle Paige; November 28, 2005; 10 pp.; In English; 2006 IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA
Contract(s)/Grant(s): 72-131-20-40-L2
Report No.(s): IEEEAC Paper 1496, Version 2; Copyright; Avail.: Other Sources; Abstract Only

We describe an approach and existing software tool support for effective interactions between human factors engineers and systems engineers in early analysis activities during system acquisition. We examine the tasks performed during this stage, emphasizing those tasks where system engineers and human engineers interact. The Concept of Operations (ConOps)

document is an important product during this phase, and particular attention is paid to its influences on subsequent acquisition activities. Understanding this influence helps ConOps authors describe a complete system concept that guides subsequent acquisition activities. We identify commonly used system engineering and human engineering tools and examine how they can support the specific tasks associated with system definition. We identify possible gaps in the support of these tasks, the largest of which appears to be creating the ConOps document itself. Finally, we outline the goals of our future empirical investigations of tools to support system concept definition.
Author
Human Factors Engineering; Support Systems; Systems Engineering

20080026349 NASA Johnson Space Center, Houston, TX, USA
NASA's Plans for Developing Life Support and Environmental Monitoring and Control Systems
Lawson, B. Michael; Jan, Darrell; February 12, 2006; 1 pp.; In English; Space Technology and Applications International Conference, 12-16 Feb. 2006, Albuquerque, NM, USA
Contract(s)/Grant(s): 516572.04.04.03; No Copyright; Avail.: Other Sources; Abstract Only

Life Support and Monitoring have recently been reworked in response to the Vision for Space Exploration. The Exploration Life Support (ELS) Project has replaced the former Advanced Life Support Element of the Human Systems Research and Technology Office. Major differences between the two efforts include: the separation of thermal systems into a new stand alone thermal project, deferral of all work in the plant biological systems, relocation of food systems to another organization, an addition of a new project called habitation systems, and overall reduction in the number of technology options due to lower funding. The Advanced Environmental Monitoring and Control (AEMC) Element is retaining its name but changing its focus. The work planned in the ELS and AEMC projects is organized around the three major phases of the Exploration Program. The first phase is the Crew Exploration Vehicle (CEV). The ELS and AEMC projects will develop hardware for this short duration orbital and trans-lunar vehicle. The second phase is sortie landings on the moon. Life support hardware for lunar surface access vehicles including upgrades of the CEV equipment and technologies which could not be pursued in the first phase due to limited time and budget will be developed. Monitoring needs will address lunar dust issues, not applicable to orbital needs. The ELS and AEMC equipment is of short duration, but has different environmental considerations. The third phase will be a longer duration lunar outpost. This will consist of a new set of hardware developments better suited for long duration life support and associated monitoring needs on the lunar surface. The presentation will show the planned activities and technologies that are expected to be developed by the ELS and AEMC projects for these program phases.
Author
Life Support Systems; Environmental Monitoring; Lunar Surface Vehicles; Space Exploration; Lunar Bases

20080026352 NASA Johnson Space Center, Houston, TX, USA
Systems Engineering and Integration for Technology Programs
Kennedy, Kruss J.; March 21, 2006; 39 pp.; In English; Project Management Challenge 2006, 21-22 Mar. 2006, Galveston, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): D953033010502; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080026352

The Architecture, Habitability & Integration group (AH&I) is a system engineering and integration test team within the NASA Crew and Thermal Systems Division (CTSD) at Johnson Space Center. AH&I identifies and resolves system-level integration issues within the research and technology development community. The timely resolution of these integration issues is fundamental to the development of human system requirements and exploration capability. The integration of the many individual components necessary to construct an artificial environment is difficult. The necessary interactions between individual components and systems must be approached in a piece-wise fashion to achieve repeatable results. A formal systems engineering (SE) approach to define, develop, and integrate quality systems within the life support community has been developed. This approach will allow a Research & Technology Program to systematically approach the development, management, and quality of technology deliverables to the various exploration missions. A tiered system engineering structure has been proposed to implement best systems engineering practices across all development levels from basic research to working assemblies. These practices will be implemented through a management plan across all applicable programs, projects, elements and teams. While many of the engineering practices are common to other industries, the implementation is specific

to technology development. An accounting of the systems engineering management philosophy will be discussed and the associated programmatic processes will be presented.
Author
Habitability; Systems Engineering; Life Support Systems; Human Performance; Management Planning; Engineering Management

20080026359 National Inst. of Information and Communications Technology, Tokyo, Japan
Review of the National Institute of Information and Communications Technology, Volume 54, No. 1
March 2008; ISSN 1349-3191; 161 pp.; In Japanese; See also 20080026360 - 20080026378; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

Topics covered include: Position and Prospect of Research and Developments for the Terahertz Technology in National Institute of Information and Communications Technology (NICT); GaAs-based Quantum Cascade Lasers; GaSb Quantum Cascade Laser; Terahertz Frontside-Illuminated Quantum Well Photodetector; Broadband Terahertz Time-Domain Spectroscopic System; High-Repetition TDS System; Broadband Millimeter Wave Imaging System; Construction of Open Terahertz Spectral Database; Terahertz Spectroscopy for Non-Invasive Analysis of Cultural Properties; Atmospheric Propagation Model of Terahertz-Wave; Introduction to Terahertz-Wave Remote Sensing; Superconducting Submillimeter-Wave Limb-Emission Sounder Onboard International Space Station I: Calibration Processing; Super-Conductive Submillimeter-Wave Limb Emission Sounder Onboard International Space Station II: Algorithm Development of for the Data Processing; MATRAS (Model for Atmospheric TeraHertz Radiation Analysis and Simulation); The MATRAS Scattering Module; Development of Epitaxial NbN THz Mixers; Terahertz Remote-Sensing of the Venusian Atmosphere: Observations using the Nobeyama Millimeter Array; Development of Remote Imaging Technologies at Terahertz Frequency; and Stand-off Gas Sensing System Based on Terahertz Spectroscopy.
Derived from text
Data Processing; Imaging Techniques; Information Systems; Submillimeter Waves; Superconductivity; Quantum Cascade Lasers; Atmospheric Models; Data Bases; Gallium Antimonides; Gallium Arsenides

20080026360 National Inst. of Information and Communications Technology, Tokyo, Japan
Super-Conductive Submillimeter-Wave Limb Emission Sounder Onboard International Space Station II: Algorithm Development of for the Data Processing
Kasai, Yasuko; Ochiai, Satoshi; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 81-92; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We have developed the Superconducting Submillimeter-Wave Limb Emission Sounder gLJ (SMILES) planned to onboard International Space Station (ISS) from 1998 in NICT on the collaboration with JAXA. The purpose of the JEMISMILES instrument is ‘super sensitive observation’ of the minor constituent in the Earth’s atmosphere, such as ClO(x), HO(x), water vapor and ice cloud. We described the algorithm development to obtain the molecular abundance in the atmosphere from the SMILES spectrum and its data simulation system.
Author
Submillimeter Waves; Superconductivity; Ice Clouds; Data Processing; Data Simulation

20080026361 National Inst. of Information and Communications Technology, Tokyo, Japan
Broadband Terahertz Time-Domain Spectroscopic System
Saito, Shingo; Sakai, Kiyomi; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 31-36; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

It is accepted now that the terahertz time-domain spectroscopy (THz-TDS) has many advantages over the traditional spectroscopy. But one weak point is that the frequency range which the THz-TDS covers has been limited to less than several THz. In order to extend this limitation to higher frequencies, we have developed a broadband THz-TDS system based on our series of researches. The system consists of a ML Ti:Sapphire ultra short pulse laser as an excitation light source and photoconductive antennas as terahertz radiation<mitter and detector. The system is designed so as to cover 0.1 -15 THz and the spectrometer is enclosed in a vacuum-tight box, which is purged with nitrogen gas. It has a revolving sample stage and it can be controlled automatically.
Author
Broadband; Photoconductivity; Pulsed Lasers; Frequency Ranges; Light Sources; Spectrometers

20080026362 National Inst. of Information and Communications Technology, Tokyo, Japan

Stand-off Gas Sensing System Based on Terahertz Spectroscopy

Shimizu, Naofumi; Furuta, Tomofumi; Kado, Yuichi; Kohjiro, Satoshi; Suizu, Koji; Komiyama, Susumu; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 143-148; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We launched into a development of a new stand-off gas sensing system that can detect 8 hazardous gases in disaster areas utilizing terahertz technology. This paper gives the outline of the system under development. The latest results of our research on terahertz transmitter and receiver are also presented. Terahertz electromagnetic wave, Remote, Stand-off sensing, Spectroscopy, Hazardous gas, Absorption line

Author

Gas Analysis; Systems Engineering; Transmitter Receivers; Remote Sensing

20080026363 National Inst. of Information and Communications Technology, Tokyo, Japan

Terahertz Remote-Sensing of the Venusian Atmosphere: Observations using the Nobeyama Millimeter Array

Sagawa, Hideo; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 129-136; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

Venusian spectra at the terahertz region are characteristic of several rotational absorption lines of minor constituents superposed on a continuum of the atmospheric thermal emission. The intensity of the continuum emission varies from 700 to 200 K with increasing the observing frequency from radio to terahertz region, which enables us to observe the Venusian atmosphere in a wide vertical range: from the surface to the cloud top. The rotational lines provide us effective tools not just to retrieve the vertical and horizontal distribution of minor constituents but also to measure the wind velocity via Doppler-shift of the line center frequency. In this paper, the results of the aperture synthesis observations of Venus with the Nobeyama Millimeter Array are presented.

Author

Venus Atmosphere; Remote Sensing; Thermal Emission; Atmospheric Temperature; Millimeter Waves; Synthetic Apertures; Line Spectra

20080026364 Nippon Telegraph and Telephone Public Corp., Tokyo, Japan

Terahertz Spectroscopy for Non-Invasive Analysis of Cultural Properties

Shimizu, Naofumi; Furuta, Tomofumi; Kohjiro, Satoshi; Suizu, Koji; Kado, Yuichi; Komiyama, Susumu; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 143-148; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

The scientific analysis of materials used in art objects can determine the period in which the objects were created, how they were kept for centuries, and how they had been restored. Terahertz spectroscopy (500 to 20/cm, or 0.6 to 15 THz), on the other hand, the motions of 47 entire molecules or inter-molecules contribute to the spectra, and can distinguish pigments and binders non-invasively. NICT collected more than 200 spectra of art materials, and most of 53 pigments have specific absorption peaks in terahertz region. Some of the spectra were indicated as THz false colours to show experimental results as a painting with material information.

Author

Binders (Materials); Electromagnetic Radiation; Spectroscopy; Data Bases; Pigments; Color

20080026365 National Inst. of Information and Communications Technology, Tokyo, Japan

Superconducting Submillimeter-Wave Limb-Emission Sounder Onboard International Space Station I: Calibration Processing

Ochiai, Satoshi; Nishibori, Toshiyuki; Ozeki, Hiroyuki; Kikichi, Ken'ichi; Manabe, Takeshi; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 69-79; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

Superconducting Submillimeter-wave Limb-Emission Sounder, SMILES, to be aboard the International Space Station has the ability to observe vertical profiles of atmospheric minor constituents by receiving limb-emission spectra from the atmosphere with its high sensitivity and precision in the 625- and 650-GHz bands. In this paper, we describe the outline of the calibration algorithm on limb-emission spectra observed by the SMILES.

Author

Submillimeter Waves; Calibrating; Atmospheric Sounding; International Space Station; Superconductivity; Precision

20080026366 National Inst. of Information and Communications Technology, Tokyo, Japan

Development of Epitaxial NbN THz Mixers

Kawakami, Akira; Takeda, Masanori; Wang, Zhen; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 117-128; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We have developed fabrication processes for epitaxial Nbn/MgO/NbN trilayers. The surface resistance of the epitaxial Nbn films was estimated to be approximately 2.6-25 m(Omega) at 0.1-0.8 THz./ We also have succeeded to fabricate epitaxial NbN/MgO/NbN Josephson tunnel junctions with good tunneling characteristics. The fully epitaxial SIS mixers showed low-noise properties over the Nb gap frequency and the DSB receiver noise was 260 k at 795 GHz. We also report a new structure and the new process of HEB mixers that uses fluoride radical etching to improve both durability and reproducibility. The receiver noise temperature of the HEB mixer was evaluated and it was about 615 K at 780 GHz.

Author

Epitaxy; Niobium Compounds; Magnesium Oxides; Josephson Junctions; Tunnel Junctions; SIS (Superconductors); Noise Temperature; Mixing Circuits

20080026367 National Inst. of Information and Communications Technology, Tokyo, Japan

High-Repetition TDS System

Morohashi, Isao; Saito, Shingo; Hosako, Iwao; Sotobayashi, Hideyuki; Sekine, Norihiko; Sakamoto, Takahide; Kawanishi, Tetsuya; Tsuchiya, Masahiro; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 37-43; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We have demonstrated ultrafast optical pulse generation using a Mach-Zehnder-modulator-based flat comb generator (MZ-FCG) and an adiabatic soliton compression technique for terahertz-time-domain-spectroscopy. Our pulse generation technique is very simple configuration and has tunability in the repetition rate and the pulsewidth. The MZ-FCG was driven by two radio-frequency sinusoidal signals. Continuous wave lights led to the MZ-FCG were converted to ultra-flat comb signals. The comb signals were formed into picosecond pulse trains by compensating the frequency chirp, and the picosecond pulses were compressed into femtosecond pulses by a dispersion flattened-dispersion decreasing fiber. Pulse trains with 200 fs-width were successfully generated.

Author

Modulators; Time Domain Analysis; Continuous Radiation; Radio Frequencies; Picosecond Pulses; Sine Waves

20080026368 National Inst. of Information and Communications Technology, Tokyo, Japan

Atmospheric Propagation Model of Terahertz-Wave

Kasai, Yasuko; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 61-64; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

Knowledge of atmospheric propagation property of terahertz-wave is very important for terahertz technology and its applications. Our final goal is development of terahertz-wave propagation model, based on accurate spectroscopic parameters of the line and continuum parts. In this paper, we introduce the atmospheric propagation model of terahertz-wave and the results of our laboratory measurements of spectroscopic parameters needed for manufacturing the model. Terahertz, Atmospheric propagation, THz-TDS, Pressure broadening coefficient, Continuum absorption

Author

Atmospheric Models; Wave Propagation; Pressure Broadening; Continuums

20080026369 National Inst. of Information and Communications Technology, Tokyo, Japan

Development of Remote Imaging Technologies at Terahertz Frequency

Oda, Naoki; Komiyama, Susumu; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 137-141; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

Terahertz (THz) radiation, 1-10 THz, has shown promise for security imaging application. For this application, real-time imaging technology will be highly desirable, which requires two-dimensional array sensor. The author pas succeeded in detecting 3.1 THz radiation from Quantum Cascade Laser (QCL) for the first time in Japan, using vanadium oxide (VOx) microbolometer focal plane array (FPA) of 320 X 240 with 23.5 y m pitch. Noise Equivalent Power of FPA at 3.1 THz is measured to be 200-400 pW. The success in THz detection and further improvement in sensitivity will provide VO(x) microbolometer FPA with new applications.

Author

Bolometers; Imaging Techniques; Focal Plane Devices; Quantum Cascade Lasers; Real Time Operation; Vanadium Oxides

20080026370 National Inst. of Information and Communications Technology, Tokyo, Japan

Introduction to Terahertz-Wave Remote Sensing

Kasai, Yasuko; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 65-67; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

There have been only a few technique with THz technology for atmospheric remote sensing observations. The development of the observation technique is quite difficult in this frequency region, because THz region is technically the boundary area between the electronics and the opto-photonics. However, recently, THz technology has made tremendous progress. In NICT, we are developing the THz remote sensing on the powerful collaboration with device development research center.

Author

Electromagnetic Radiation; Remote Sensing; Radiative Transfer; Photonics; Pollution; Ice Clouds; Atmospheric Sounding

20080026371 National Inst. of Information and Communications Technology, Tokyo, Japan

Broadband Millimeter Wave Imaging System

Mizuno, Maya; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 45-50; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We developed a system for imaging the dielectric properties of materials in the millimeter f range from 30 GHz to 70 GHz. It can observe the distribution of dielectric properties of materials Y including composites at various frequencies. Experimental results proved that the system clearly observes metal distribution at 35, 45, 55 and 65 GHz, by transmission imaging as well as by 3 reflection imaging. One of the important features in practice is its ability to distinguish water and ‘ ice in other materials. The new imaging system can used to evaluate distribution of dielectric III properties of materials in various fields such as engineering and medicine.

Author

Broadband; Millimeter Waves; Imaging Techniques; Microwave Imagery; Microwave Transmission; Dielectric Properties

20080026372 National Inst. of Information and Communications Technology, Tokyo, Japan

MATRAS (Model for Atmospheric TeraHertz Radiation Analysis and Simulation)

Baron, Philippe; Mendrok, Jana; Kasai, Yasuko; Ochiai, Satoshi; Seta, Takamasa; Sagi, Kazutoshi; Suzuki, Kodai; Sagawa, Hideo; Urban, Joachim; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 93-105; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We describe the current status of the Model for Atmospheric TeraHertz Radiation Analysis and Simulation (MATRAS) that is being developed in the framework of the NICT THz project. This code aims to be used for studying the insterest of the THz frequency region for atmospheric remote sensing, communication systems and estimate the impact of the THz thermal atmospheric emission in the Earth energy budget. This paper presents the first stage of the model development that concerns a non scattering and a horizontally homogeneous atmosphere, e.g., the geophysical parameters are only altitude dependent. A scattering module is being developed but it is presented in an other paper in this issue. The model is based on the Microwave Observation and Lines Estimation and REtrieval code (MOLIERE). The absorption coefficient module has been modified in order to extend the frequency coverage from the submillimeter wavelength to the near InfraRed region. A new radiative transfer module has been implemented that can handle the different types of optical paths and any location for the receiver. MATRAS includes the original MOLIERE instrument simulator and retrieval codes. The validation methodology is discussed and some examples of the current applications are given. The next steps of the development are presented in the conclusion including the modelling of the horizontal inhomogeneties in the atmosphere. We describe the current status of the Model for Atmospheric TeraHertz Radiation Analysis and Simulation (MATRAS) that is being developed in the framework of the NICT THz project. This code aims to be used for studying the insterest of the THz frequency region for atmospheric remote sensing, communication systems and estimate the impact of the THz thermal atmospheric emission in the Earth energy budget. This paper presents the first stage of the model development that concerns a non scattering and a horizontally homogeneous atmosphere, e.g., the geophysical parameters are only altitude dependent. A scattering module is being developed but it is presented in an other paper in this issue. The model is based on the Microwave Observation and Llnes Estimation and REtrieval code (MOLIERE). The absorption coefficient module has been modified in order to extend the frequency coverage from the submillimeter wavelength to the near InfraRed region. A new radiative transfer module has been implemented that can handle the different types of optical paths and any location for the receiver. MATRAS includes the original MOLIERE instrument simulator and retrieval codes. The validation methodology is discussed and some examples of the current

applications are given. The next steps of the development are presented in the conclusion including the modelling of the horizontal inhomogeneties in the atmosphere.
Author
Atmospheric Models; Submillimeter Waves; Atmospheric Sounding; Near Infrared Radiation; Thermal Emission; Telecommunication; Remote Sensing; Radiative Transfer; Atmospheric Radiation

20080026373 National Inst. of Information and Communications Technology, Tokyo, Japan
Position and Prospect of Research and Developments for the Terahertz Technology in National Institute of Information and Communications Technology (NICT)
Hosako, Iwao; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 3-8; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

Active research and development are now progressing on the application of electromagnetic waves known as terahertz waves. Universities, national research institutions, venture companies, and even major corporations are now beginning research and development in this area. Many examples demonstrate the usefulness of sensing and imaging with terahertz waves in various aspects of industry and society. Discussions have also begun on new high-bit-rate ultra-short-distance wireless technology that takes advantage of the ultra-high-frequency characteristics of terahertz waves. At this stage we cannot even imagine the eventual number and kinds of terahertz applications that will emerge. According to the March 2005 'Terahertz Technology Trend Report' of the Ministry of Internal Affairs and Communications and the 'Terahertz Technologies, R&D, Commercial Implication and Market Forecast' of Fuji-Keizai USA Inc. issued in August 2007, the question is not whether the market for terahertz technology will increase-it inevitably will-but by how much. Given this background, the National Institute of Information and Communications Technology (NICT) launched its 'Terahertz Project' in April 2006. The Terahertz Project aims to develop fundamental terahertz technologies at the national level for expanding applications in diverse fields. These fundamental technologies include those incorporated in small high-performance devices and measurement systems and high-precision light sources, as well as those required in the construction of an atmospheric propagation model, the construction of spectral databases of materials, and the standardization of measurement procedures. This special issue reports on the achievements obtained to date in independent research and development conducted directly by NICT (including semiconductor device technology, system technology, databases, and atmospheric propagation) as well as in contract research undertaken by external organizations. In this discussion, we indicate the direction in which each project is heading, in view of the important benchmarks in the future development of terahertz technology.
Author
Research; Frequency Distribution; High Frequencies; Semiconductor Devices; Time Domain Analysis; Light Sources; Electromagnetic Radiation

20080026374 National Inst. of Information and Communications Technology, Tokyo, Japan
GaAs-based Quantum Cascade Lasers
Sekine, Norihiko; Hosako, Iwao; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 9-18; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

Quantum cascade lasers (QCLs) have different structures and characteristics from those of conventional semiconductor lasers commonly used ina the optical communication systems. Therefore, QCLs make it possible for us to access wavelengths which couldn't be available in conventional lasers. In particular, terahertz QCLs (THz-QCLs) have been paid much attention due to their potential applications in various fields, such as biosensing, imaging, and security. In this paper, we report GaAs-based THz-QCLs. The peak output power of about 30 mW was obtained in a pulsed operation at low temperature. The maximum operating temperature above 120 K was achieved.
Author
Quantum Cascade Lasers; Semiconductor Lasers; Gallium Arsenides; Imaging Techniques; Optical Communication; Telecommunication; Operating Temperature

20080026375 National Inst. of Information and Communications Technology, Tokyo, Japan
GaSb Quantum Cascade Laser
Yasuda, Hiroaki; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 19-23; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

A GaSb/AlSb terahertz quantum cascade laser (THz-QCL) using a resonant longitudinal x optical (LO) phonon depopulation scheme was successfully demonstrated. A smaller threshold 9, electric field was expected for the GaSb/AlSb

QCL because GaSb has a lower LO phonon energy and smaller electron effective mass than GaAs. Experimental results indicated that the threshold electric field of the GaSb/AlSb QCL was 3.2 kV1cm. These results mean that the GaSb/AlSb QCL is suitable for low input power operation. Furthermore, the GaSb/AlSb QCL on a GaAs substrate using single surface plasmon waveguide provides high confinement of terahertz waves in the QCL active region without a complicated fabrication process. Author

Quantum Cascade Lasers; Gallium Arsenides; Gallium Antimonides; Electric Fields; Phonons

20080026376 National Inst. of Information and Communications Technology, Tokyo, Japan

Terahertz Frontside-Illuminated Quantum Well Photodetector

Patrashin, Mikhail; Hosako, Iwao; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 25-30; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We have demonstrated the operation of a frontside-illuminated GaAs/AlGaAs quantum well photodetector based on intersubband absorption in a quantum well (QW) with a targeted peak frequency of 3 THz. A multiple quantum well structure consists of 20 periods of 18 nm QWs interleaved by 80 nm barriers with an Al alloy content of 2 %. We measured the following performance characteristics: dark current, responsivity, and spectral response. A responsivity of 13 mA/W at an electric bias of 40 mV and an operating temperature of 3 K was obtained with a peak response close to the designed detection frequency. The dark current density was a few (mu)A/sq cm and was limited by thermally assisted tunneling through the barriers. We looked also at possible designs to optimize the device's performance.

Author

Photometers; Quantum Wells; Aluminum Gallium Arsenides; Gallium Arsenides; Semiconductors (Materials); Aluminum Alloys; Current Density

20080026377 National Inst. of Information and Communications Technology, Tokyo, Japan

The MATRAS Scattering Module

Mendrok, Jana; Baron, Philippe; Kasai, Yasuko; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 107-116; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

We introduce the cloud case version of the Model for Atmospheric Terahertz Radiation Analysis and Simulation (MATRAS) that has been developed in the framework of the NICT Terahertz project. The current status of the cloudy atmosphere modules, that have a strong heritage from the [Approximate] Spherical Atmospheric Radiative Transfer (SARTre) model, is described with a focus on new developments for the Terahertz spectral region. Deviations of model approaches from clear-sky MATRAS are discussed and future plans are pointed out.

Author

Atmospheric Models; Ice Clouds; Atmospheric Scattering; Radiative Transfer; Modules; Atmospheric Radiation

20080026378 National Inst. of Information and Communications Technology, Tokyo, Japan

Construction of Open Terahertz Spectral Database

Fukunaga, Kaori; Review of the National Institute of Information and Communications Technology, Volume 54, No. 1; March 2008, pp. 51-56; In Japanese; See also 20080026359; Copyright; Avail.: Other Sources

The terahertz spectroscopy is expected to become a new non-invasive analyser in various applications since the terahertz wave can penetrate into opaque materials and can analyse multi-layered specimens with a time domain spectroscopy described in the previous section. Terahertz spectra correspond to molecular or inter-molecular behaviour unlike mid-infrared spectra which give intra-molecular information. Any kind of spectroscopy requires spectra databases for practical applications. Limited number of spectra is sufficient when the target materials are specific, such as explosives and illegal drugs. Although there are some terahertz spectral data book which contain spectra for atmospheric transmission studies etc., construction of common database with various substances is essential to enlarge the application fields of terahertz spectroscopy.

Author

Spectroscopy; Emission Spectra; Data Bases; Construction; Penetration

20080029248 NASA Johnson Space Center, Houston, TX, USA

Phase II Testing of Liquid Cooling Garments Using a Sweating Manikin, Controlled by a Human Physiological Model

Paul, Heather; Trevino, Luis; Bue,Grant; Rugh, John; July 17, 2006; 8 pp.; In English; International Conference on Environmental Systems, 17-20 Jul. 2006, Norfolk, VA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 831288.04.04.04

Report No.(s): 06ICES194; No Copyright; Avail.: CASI: A02, Hardcopy

An Advanced Automotive Manikin (ADAM) developed at the National Renewable Energy Laboratory (NREL) is used to evaluate NASA's liquid cooling garments (LCGs) used in advanced space suits for extravehicular applications. The manikin has 120 separate heated/sweating zones and is controlled by a finite element physiological model of the human thermoregulatory system. Previous testing showed the thermal sensation and comfort followed the expected trends as the LCG inlet fluid temperature was changed. The Phase II test data demonstrates the repeatability of ADAM by retesting the baseline LCG. Skin and core temperature predictions using ADAM in an LCG/Arctic suit combination are compared to NASA physiological data to validate the manikin/model. Additional LCG configurations are assessed using the manikin and compared to the baseline LCG. Results can extend to other personal protective clothing, including HAZMAT suits, nuclear/biological/chemical protective suits, and fire protection suits.

Author

Space Suits; Thermoregulation; Liquid Cooling; Extravehicular Mobility Units; Human Factors Engineering

20080029256 NATO Research and Technology Organization, Neuilly-sur-Seine, France

Survival at Sea for Mariners, Aviators and Search and Rescue Personnel

February 2008; 178 pp.; In French; See also 20080029257 - 20080029270; Original contains color and black and white illustrations

Report No.(s): RTO-AG-HFM-152; AC/323(HFM-152)TP/75; Copyright; Avail.: CASI: C01, CD-ROM: A09, Hardcopy

This AGARDograph summarizes the current scientific knowledge of sea survival for mariners, aviators, search and rescue technicians and medical staff. The text discusses key issues such as drowning through cold shock and swimming failure induced by immersion in water particularly below 15 Celsius, survival prediction curves and non-freezing cold injuries. It emphasizes the importance of integrating good human engineering practices at the beginning of a project involving survival equipment such as life-jackets, life rafts and lifeboats. Manikin testing to evaluate survival suit insulation is described. The latest helicopter ditching statistics and helicopter underwater escape protocols are presented. Practical advice is given on the causes and treatment of sea-sickness. Finally a discussion is had on the importance of understanding how humans mentally process information under stress and why this should be included in every survival school curriculum.

Author

Rescue Operations; Seas; Human Factors Engineering; Aircraft Pilots; Marine Environments; Survival Equipment

20080029257 Dalhousie Univ., Halifax, Nova Scotia, Canada

An Application of Human Factors in Life Support Equipment and Emergency Egress, Chapter 11

Kozey, J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 11-1 - 11-10; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Our world is filled with thousands of devices, tools, machines and products which when assembled into functional units form systems. By definition a system is a set of elements developed to achieve an objective. A well designed system considers the relations amongst the elements and the boundaries around the elements to provide for the proper considerations of the interaction of the elements to the overall objective. Generally systems have a defined input, process and output. In terms of the design, operation and control, systems range from very simple to very complex. In many industrial sectors, these systems can range in type from manual to mechanical to finally automatic. In order for these systems to achieve their optimal level of performance they must at sometime interface with humans and therefore the human becomes an important element in the total system. Many people would argue that the human may be the most important element in the system and that the system must 'fit the task to the human'. Fitting the task to the human is a phrase first introduced by Grandjean in 1981. The process of considering the job of fitting the task to the human describes the science of Human Factors and is also known as Ergonomics. At least from my perspective the terms Human Factors and Ergonomics are interchangeable and for the remainder of this chapter I will use the term Human Factors to avoid any confusion to the reader. Human Factors generally considers the three major elements of a system to be the Human, Machine(s) and the Environment. The Human-Machine-Environment (HME) approach considers the work and system design as a complex interaction of individual elements of the system and the more importantly the interaction of the elements within the system. For example, if you were to analyze your present situation

as you are reading this chapter or your current workplace, and I were to ask you to list a number of components or factors in the HME system, you might begin with a list similar to the entries presented in Table 11-1. Take a moment look around your particular area and expand this list.
Derived from text
Human Factors Engineering; Life Support Systems; Systems Engineering; Emergencies; Egress

20080029258 Portsmouth Univ., Portsmouth, UK
Thermoregulation, Chapter 2
Tipton, M. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 2-1 - 2-6; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Humans belong to a group of animals called 'homeotherms'. To ensure optimal physiological function and survival, these animals must regulate their deep body temperature within a narrow range despite large changes in environmental temperatures. To do this their heat loss and heat production must be balanced; if it does not they will become hyperthermic (hot) or hypothermic (cold), with consequences that range from mild impairment of performance to death. The equation which describes heat balance is: M-(W) = R +/-C+/-K-E where: M = metabolic rate. W = measurable external work. R = heat exchange to and from (+/-) the environment by radiation (R). C = heat exchange to and from (+/-) the environment by convection. K = heat exchange to and from (+/-) the environment by conduction. E = heat loss (-) to the environment by evaporation. The unit for each term is generally quoted as watts per square metre of body surface area (W.m-2). a) M(Metabolism). The chemical reactions of the body liberate energy during metabolism. The biggest cause of variation in energy expenditure is exercise. About 75% of the chemical energy used during muscular contraction is converted to heat. b) R(Radiation). All objects possessing heat emit thermal radiation from their surfaces in the form of a wave of energy containing particles within the red-infrared range of the electromagnetic spectrum. The energy from these particles are absorbed by, and transferred to, the atoms of objects they come into contact with. No medium is required for the transfer, thus, radiation is the process by which the energy of the sun travels through the vacuum of space to reach earth. c) C(Convection). In a naked person standing in cool air (below skin temperature), air molecules coming in contact with the body will be warmed, the density of the warmed air is reduced causing it to rise and be replaced with cooler air. This process is called 'natural (or free) convection'. Convective heat exchange is increased by: air (wind) or water (current) movement across the skin (this is called 'forced convection'); or the movement of the body in air or water ('relative wind speed/water current'). The exchange of heat between a body and its environment through convection depends on the temperature gradient between the two and the relative movement of the fluid (air or water) in which the body is placed. d) K(Conduction). This term is used to describe heat exchange between the skin and surrounding surfaces with which it touches. Usually the amount of heat exchanged in this way is small and is dependent upon: a) The temperature gradient between the skin and the surface with which it is in contact; b) The surface area in contact; and c) The thermal conductivity (ease with which heat moves through a substance) of the surface in contact with the skin. e) E(Evaporation). Evaporation is the process by which energy transforms liquid into a gas. Thus, evaporative heat exchange only occurs when fluid evaporates from the surface of an object. The heat required to drive this process is removed from that surface and it is cooled. This is termed the 'latent heat of vaporization', for water it amounts to 576 kcal.L-1 (2,408 kJ.L-1). The rate of evaporation depends on: a) The skin surface area that is wet; b) The air movement around the body (wind or body movement); and c) The difference between the vapour pressure at the skin surface and that in the air.
Author
Ambient Temperature; Thermal Conductivity; Thermoregulation; Heat Transfer; Hypothermia; Temperature Gradients; Physical Exercise; Body Temperature; Convective Heat Transfer

20080029259 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada
Introduction to the RTO Technical Course: Survival at Sea for Mariners, Aviators and Personnel Involved in Search and Rescue - HFM-106, Chapter 1
Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 1-1 - 1-4; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Your Course Director had the privilege of being taught by such scientists as Peter Barnard, Peter Bennett and David Elliot when he attended his basic Royal Navy Medical Officer Introductory Course in Alverstoke, Gosport, U.K. in 1966. Then, the R.N. Institute of Naval Medicine was humming with expertise. Many of the staff there and next door at HMS Dolphin had Second World War expertise in survival medicine, and the new nuclear medicine submarine programme had been operating

for about 5 years. The Royal Navy Personnel Research Committee met regularly. At this time, it was possible to personally discuss problems with distinguished working scientists such as Hervey, Keatinge, McCance, and Pugh. These were the people who changed our whole mind set about death at sea. Now, we knew it was a series of physiological responses that needed to be addressed by the World s Navies and Industry with better protective clothing, e.g. lifejackets and survival suits. The term hypothermia first came into our survival language. Moreover, the scientists brought about a whole attitude change which was needed in our Survival Training Schools; no longer was drowning due to fate and an acceptable occupational hazard. People could be saved during the survival phase of marine abandonment. In 1981, it was Golden and Hervey who then made the next significant step forward in cold water physiology. They published the classic work on the four stages in which death can occur from sudden unexpected immersion in cold water. Up until then, our pioneers considered that hypothermia was the most important cause of death after shipwreck. Cold shock and swimming failure were known, but were only considered of academic interest. Even though this was 26 years ago, this information is still only just becoming widely known and the concept applied. Things don t happen very quickly in the marine world! Over the last 41 years, I have watched this change in philosophy occur. In a small part, I have been able to assist particularly in the human factors of escape and survival from helicopter ditchings and the introduction of emergency breathing systems. As time marched on, it became clear to me that the celestial umpire was calling in many of these experts; we thought they would be there forever to provide their wisdom and advice. Sadly when they retired or died, the universities did not replace them. For some reason, human physiology is considered to be a mature science (not by me!). Many University Faculties consider it is much easier to replace the scientists with mathematical modelers. In the 21st Century, this of course is the path of least resistance, no need for human ethics committees, models take up much less space than elegant pools, wave tanks, cold chambers, no worries about litigation because no-one gets a non-freezing cold injury and no-one slips on a wet pool deck, etc. Now, for instance here in Canada, all of a sudden, we find that 7 very fine University laboratories producing excellent applied physiological work reduced to only half of this capability, if not less. Canada is not unique, the USA and European countries have had the same experience. We will likely live to regret this decision.

Author

Human Factors Engineering; Escape (Abandonment); Military Operations; Physiological Responses; Protective Clothing; Rescue Operations; Survival; Hypothermia

20080029260 Defence Research and Development Canada, Toronto, Ontario, Canada

Seasickness: Guidelines for All Operators of Marine Vessels, Marine Helicopters and Offshore Oil Installations, Chapter 8

Cheung, B.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 8-1 - 8-24; In English; See also 20080029256; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Many different forms of transport, from surface vehicles (land and sea) to air and space vehicles, cause motion discomfort with symptoms ranging from nausea to vomiting and/or retching in susceptible individuals. These symptoms are collectively known as motion sickness. The most dreaded kind of motion discomfort occurs on long duration voyages where the susceptible individuals often feel that they are effectively imprisoned in the nauseogenic environment. Seasickness is the most widely experienced form of this oppressive motion sickness. Reports of seasickness, also known as kinetosis and naupathia date back as far as the authors of Greek mythology, who were familiar with the discomforts associated with seasickness. It seems likely that humans suffered from seasickness well before they could make written records of it. Lord Nelson was a chronic sufferer of seasickness, even on his final voyage to fight at Trafalgar. Sir Charles Darwin never missed a chance to get off the boat during his famous voyage on the Beagle because he too succumbed to seasickness. Irwin [68] recorded the term motion sickness as follows: Seasickness, or motion sickness, as it might be more correctly named for not only does it occur on lakes and even on rivers, but, as is well known, a sickness identical in kind may be induced by various other motions than that of turbulent water is essentially a disturbance of the organs of equilibration Usage of the term motion sickness was popularized by Sir Frederick Banting during the Second World War when seasickness and airsickness were studied together. However, with the advance in knowledge and technology, the term motion is a misnomer as the symptom characteristics can be evoked as much by the absence of expected motion as by the presence of unfamiliar or apparent conflicting motion. For example: simulator sickness and cyber sickness (sickness induced by computer generated virtual displays) are examples of conditions where the evocative stimulus is the absence of physical motion stimuli and the presence of visually induced apparent sensation of self motion. The term sickness is also a misnomer as it carries a connotation of "(affected with) disease'. It obscures the fact that motion sickness or seasickness is a normal physiological response of a healthy individual without organic or functional disorder, when exposed to unfamiliar or conflicting motion of sufficient severity for a sufficient period of time. Hence, seasickness and other associated forms of motion sickness (airsickness, carsickness, simulator sickness

and space sickness) can now be defined as a maladaptive response to real and apparent motion. However, it should be noted that visually induced sickness comprises a number of motion sickness-like signs and symptoms, with slightly different profiles from true motion sickness. Visually induced sickness is generally less severe, but the after-effects (flashback from cyber sickness) can appear much later after the initial exposure. Therefore it is important to distinguish the stimuli that were used when evaluating the results of laboratory studies on the effects and countermeasures of motion sickness.
Author
Motion Sickness; Offshore Energy Sources; Physiological Responses; Space Adaptation Syndrome; Surface Vehicles; Exposure; Signs and Symptoms

20080029261 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada
Life Rafts and Lifeboats: An Overview of Progress to Date
Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 9A-1 - 9A-16; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The most under studied, under funded item and out of date piece of equipment in the helicopter over-water operation is the inflatable life raft. This was brought to the attention of the NATO community in 1998 in an RTO paper titled 'The abysmal performance of the inflatable life raft in helicopter ditchings' by this author [9]. On the marine side, the introduction of the Totally Enclosed Motor Propeller Survival Craft (TEMPSC) has been an improvement over the open 'Titanic' type of life boats, but these life boats still have a long way to go in design. In general, aviation and marine engineers and operators do not consider the life raft/lifeboat/TEMPSC in their design/survival equation. This is left as a blank box 'to be filled later' with the current 'approved' life raft. Naturally, when it becomes time to purchase the life raft - which incidentally is a very expensive piece of equipment, management which may not be co-located with the designers and operators, do little consultation with them. They often choose the cheapest item paying little or no attention to the integration and fit on the ship/rig/helicopter and the training of the crew and passengers. The purchased item may perform very poorly in a ditching, marine abandonment procedure although, there is nothing wrong with the life raft itself! From time to time, worried pilots and upset coxswains contact this author and request us at Survival Systems Ltd to visit their local operation and examine their lifeboats and life rafts. It becomes blatantly obvious that a purchase order has been issued for an approved lifeboat or life raft, yet no thought has been given about integration into the helicopter, the ship or the oil rig, or indeed any specific local environmental requirement. Middle and Senior Management sit back and feel happy that the lifeboat/life raft has been purchased and approved, but at the working level everyone struggles to fit a very expensive square peg into a round hole. Requests for returns, modifications, etc., are immediately rejected until the first incident/accident/loss of life occurs. A very serious accident was recently just avoided when it was discovered that the roof of a new free fall TEMPSC compressed in on a launching. The distance of travel was enough to cause serious injury to any occupants sitting in the upper row of seats. Fortunately these were not manned on the first launch! This self-denial attitude is common in all aspects of safety management. It has been addressed extensively by Professor Reason in his textbooks on human error and Professor Leach s textbook on the Psychology of Survival. This topic is discussed in a separate lecture in this RTO series. This is the perfect example of where human engineer consultation should be brought in at the design stage, when it costs very little to do. Implementation of design change and retooling for manufacturing at a later stage adds unnecessary costs. Band-aid solutions that don t really work are often hastily instigated, but are necessary because the high cost of re-design is prohibitive. Professor John Kozey will present a lecture to you in the series on this very problem.
Author
Life Rafts; Lifeboats; Safety Management; Human Performance; Survival; Injuries; Helicopters; Attitude (Inclination)

20080029262 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada
Drowning is Not a Helpful Diagnosis Written on the Death Certificate, Chapter 10
Brooks, C. J.; Howard, K. A.; Jenkins, J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 10-1 - 10-10; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

A cursory look at the title of this paper may give the readers the impression that this is of little interest to them. This is a very false assumption. This paper is of great importance for anyone who is involved in accident investigation where a drowning has occurred. It is also of great importance to all marine survival instructors and health and safety managers. Only by understanding the underlying causes of the drowning, is it possible to establish the correct equipment and training preventive measures. Over the centuries, hundreds and thousands of people who earn their living working on or over the water have drowned, particularly in cold water. It is only in the last 50 years that anyone has taken this death toll seriously. Records

of death from immersion in cold water date back to ancient times. During the Greek-Persian war (circa 450 BC), Herotodus was able to distinguish death from drowning compared to hypothermia [8]. Yet, it was not until the middle of the Second World War, and the analysis of the losses after the cessation of hostilities that the UK and Germany recognized the dangers of sudden cold water immersion [10, 11]. It was not until the Korean war that the USA also realized there was a problem [13]. Consequently, over the last half of the 20th Century, there has been considerable human experimentation performed internationally in cold water physiology. The pioneering work was done in the mid 1940s and 1950s, but by the 1960s, it was forgotten and needed to be relearned. A full summary of this work can be found in the new book written by Golden and Tipton in 2002 [7]. The loss of life in the new Offshore Oil Industry created a demand for more research to produce better immersion suits. This created a flurry of new experimentation in the 1980s and 1990s. In 1981, Golden and Hervey produced their classic work on the four stages in which death may occur in a cold water accident [6]. These are: stage 1, cold shock, which kills within 3-5 minutes of immersion; stage 2, swimming failure, which kills within the first 30 minutes of immersion; stage 3, hypothermia, which kills after 30 minutes of immersion; and finally, stage 4, post rescue collapse, which kills during or shortly after rescue. Tipton provided a review of the initial response of cold shock in 1989 and conducted further experimentation to explain the phenomena of swimming failure [12]. Until relatively recently, stage 1 (cold shock) and stage 2 (swimming failure) were considered of academic interest only. As a result, regulators, teaching establishments and survival suit manufacturers all concentrated their efforts on protecting the human from hypothermia. In this regard, they have done a very good job. As a result, cold wet bodies removed from the water were assumed in many cases to have died from hypothermia, yet they had not been in the water long enough to become hypothermic. Even though there are well established teaching programs, good regulations and much improved life saving equipment, there are still 140,000 open water deaths worldwide each year [6]. Barss reported in 2006 that 2,007 people died of cold water immersion in Canada between 1991 and 2000 [1]. What has been overlooked is the significance of the first two stages - cold shock and swimming failure as a cause of death. The severity of the effects of cold shock appears to be most dangerous to the human when suddenly immersed in water below 15 C. Below this temperature, the cold shock response is potentially lethal. This physiological information has not been disseminated to accident investigators, emergency room physicians, coroners and pathologists. As a consequence, they have not realized the significance of the first two stages. Their line of investigation has not asked the specific questions that might indicate that one or both of these stages contributed to drowning. A typical accident report contains many pages related to the mechanical condition of the vessels and navition aids, etc., but because the investigators are often under educated in the subject, the human factors aspect is often summarized in less than one paragraph. Here the final published ‘official’ cause of death is listed as ‘exposure’, ‘presumed drowned’ or ‘drowned’

Author

Accident Investigation; Emergencies; Human Factors Engineering; Hypothermia; Water Immersion; Swimming; Submerging; Rescue Operations; Hazards

20080029263 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada

Immersion Suits: Their Development, Chapter 9C

Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 9C-1 - 9C-14; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

For an extensive review of this immersion suit topic, please refer to Brooks Survival in Cold Waters Staying Alive. [5] It is quite astonishing that over the centuries, thousands of humans have drowned in cold water. It is only in the last 50 years that anyone has taken this death toll seriously. Death was attributed to drowning from an inability to stay afloat and attributed to vague terms, such as exposure. This is because death at sea was, and to some degree still is taken for granted. According to the International Labour Organization, Fishermen experience 24,000 deaths each year. They simply consider it as an occupational hazard and fate [20]. Until post-Second World War, any attempt at protection was to float the person in rather than out of the water. Since biblical times, there was a vague understanding of the dangers of cold water immersion, but little positive action was taken by Maritime Nations. As stated above, loss of life at sea was accepted as fate and an occupational hazard. Wrecking was not made illegal until 1807 and the Royal Navy s use of impressment was not abandoned until 1815. Thus, such items as lifejackets and immersion suits, which could be used to aid escape from impressments were not encouraged. Little specific design of immersion suits was conducted until the middle of the 19th Century. The only work on survival equipment had been the pioneering work of Captain John Ross Ward. He developed a life jacket in 1851 for the National Lifeboat Institution [21]. Then in 1869, Captain Stoner invented a patent life saving apparatus, which was revolutionary for the time and addressed all the fundamental modern day requirements of a survival suit; they were all designed and integrated together. It included a waterproof suit, a lifejacket, head protection, a signaling device and paddles for aiding passage through the water. In 1912, no one paid attention to the observations by Lawrence Beesley [3]. He was a

survivor from the Titanic who noted that the victims wearing lifebelts and in cold, but calm water had died of cold. The official cause of death was given as drowning. The International Maritime Organization Safety of Life at Sea (SOLAS) Committee was formed directly as a result of this accident, but no thought was given to personal thermal protection. Everyone was obsessed with floating in and not out of the water. At the outbreak of the Second World War little serious research had been conducted on lifejackets, the behavior of an unconscious person in water and virtually nothing on survival suits.
Derived from text
Thermal Protection; Waterproofing; Military Operations; Jackets; Exposure; Submerging; Survival Equipment; Water Immersion

20080029264 Portsmouth Univ., Portsmouth, UK
The Dangers of Sudden Immersion in Cold Water, Chapter 3
Tipton, M. J.; Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 3-1 - 3-10; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As you will read repeatedly throughout the papers in this lecture series, death at sea until now has been regarded by many as fate and an occupational hazard. For a full account of sea survival, then the textbook 'Essentials of Sea Survival' by Golden and Tipton is recommended for all survival instructors [13]. Hypothermia was described by Herodotus [20] during the Persian/Greek War as far back as 450 BC but life was cheap and no one paid much attention to the cause of drowning. Brief interest was shown in the 18th Century when James Lind (1792) described post-rescue collapse, Hutchinson (1794) wrote a book 'To preserve the health and comfort of sea voyagers', and Currie (1797) noted hypothermia and post-rescue collapse. As described in the lecture on immersion suits, the Royal Navy policy of impressments was not discontinued until 1815. So there was no incentive to provide flotation systems, protective clothing and investigate the cause of drowning. After all, their Lordships would argue, if a ship sank in battle there was plenty of flotsam and jetsum to provide support. In 1805, at the Battle of Trafalgar, sailors clung to masts and spars for 15 hours before rescue. The advent of iron ships in the mid 1850s only exacerbated the drowning statistics. In 1892, the USA was the first nation to regulate the carriage of lifejackets on passenger vessels. They were reluctantly followed by Britain, France, Germany, and Denmark. The Titanic accident in 1912 caused the formation of the International Maritime Organization (IMO) who produced the Safety of Life at Sea (SOLAS) regulations. Now there was international regulation requiring the carriage of life jackets. Lord Mersey in his investigation of the Titanic accident did not ask why the passengers on the Titanic were floating dead in perfectly good life jackets on the surface of the water. The path of least resistance was to assign the diagnosis drowning - and this to a certain degree is still what is happening in 2007. During the First World War 12,000 Royal Navy sailors, 10,000 merchant seamen and 5,000 German sailors drowned. Yet no one paid much attention to this dreadful statistic, and certainly no serious physiological examination into the cause of death was initiated.
Author
Cold Water; Hypothermia; Water Immersion; Submerging; Rescue Operations; Protective Clothing; Survival; Diagnosis; Floating

20080029265 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada
Knowledge of Human Behavior Under Stress and Sleep Deprivation Will Enable You to Prevent Accidents and Death, Chapter 6
Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 6-1 - 6-16; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

I recently spoke at a very well attended OGP meeting of the marine and offshore oil industry in Cairo, Egypt. The principle topic was how to develop strategies to prevent accidents, injury, and death. In other words, how to make the work place a great deal safer. Yet, apart from myself and a colleague from Aberdeen, there were only a few other attendees that I met who had any knowledge of human engineering, human physiology or had an applied psychology background; all these disciplines being so important in analysing the causes of accidents and incidents [7, 8]. No one was aware of all the pioneering work done by Professor Reason on human error and Professor Leach on performance under stress [3, 4, 5]. The fact that struck me most was that these attendees were operators, regulators and human resource personnel. Most of the decisions made at this meeting were designed to close the loop holes and prevent possible short cuts in the procedures that cause accidents. They added yet another layer of rules and regulations to an already highly regulated environment. This was in complete disregard as to how the human processes information under normal or stressful situations. The aviation industry was represented as well. They demonstrated that they had already made some progress with addressing the human factors issue and its relationship to accidents and

incidents. In my opinion, the marine and offshore oil industries were way behind. I hope this paper starts to get you back on track. The objective then is to persuade you to: 1) Understand the problem with shift work and examine your shift work policies and practices. 2) Introduce good human engineering practices into your operation. 3) Use human engineers in all aspects of your business from initial planning all the way through to full scale operations. 4) Use human engineers in all your accident / incident / near miss investigations, and pay attention to what they conclude and advise. 5) Identify good applied psychology and applied physiology scientists and occupational medicine physicians that can give you additional advice. 6) Teach teamwork in emergency procedures. When a problem occurs, there is too much information for a single human to analyse and react correctly. The O.I.M. of the rig, the pilot of a 777, and the Captain of a Cruise ship cannot deal with all the problems him/herself. A lot must be delegated and a bond of trust must be developed within the team. 7) Don t fire the guy who screwed up it may not really be his/her fault, but an endemic problem of the system. Listen to him or her because this may be the only chance you have of learning about what really happened. If the work policy is to fire anyone who commits a slip or an error, you will never discover the root cause, and the problem will re-occur.
Derived from text

Accident Investigation; Human Factors Engineering; Human Performance; Engineers; Offshore Energy Sources; Emergencies; Human Behavior; Procedures; Regulations; Ships; Sleep Deprivation

20080029266 Portsmouth Univ., Portsmouth, UK

Non-Freezing Cold Injuries, Chapter 4

Tipton, M. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 4-1 - 4-4; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Human tissue freezes at around -0.55 C and depending on the rate of freezing intracellular crystals may form (rapid cooling) causing direct mechanical disruption of the tissues. The more common slow cooling and freezing results in predominantly extracellular water crystallisation that increases plasma and interstitial fluid osmotic pressure. The resulting osmotic outflow of intracellular fluid raises intracellular osmotic pressure and can cause damage to capillary walls. This, along with the local reduction in plasma volume, causes oedema, reduced local blood flow and encourages capillary sludging. These changes can produce thrombosis and a gangrenous extremity. The risk of frostbite is low above air temperatures of -7 C, irrespective of wind speed, and becomes pronounced when ambient temperature is below -25 C, even at low wind speeds. NFCI is the term given to describe a condition that results from protracted exposure to low ambient thermal conditions, but in which freezing of tissues does not occur. Immobility, posture, dehydration, low fitness, inadequate nutrition, constricting footwear, fatigue, stress or anxiety, concurrent illness or injury can all increase the likelihood of NFCI. The precise pathophysiology NFCI is poorly understood; the injury appears to be to the neuro-endotheliomuscular components of the walls of local blood vessels. Opinions vary as to whether the primary damage is vascular or neural in origin; or, whether the aetiology is primarily thermal, ischaemic, post-ischaemic reperfusion, or hypoxic in origin. The chronic sequelae of mild to moderate cold injury are: ‘cold sensitivity’ (protracted cold vasoconstriction following a cold stimulus) and hyperhidrosis (local increased sweating), both of which accentuate local cooling and thus increase future risk of cold injury.
Author

Exposure; Frostbite; Blood Flow; Dehydration; Hypoxia; Sicknesses; Vasoconstriction; Freezing

20080029267 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada

The Principles of Emergency Breathing Systems (EBS) for Helicopter Underwater Escape, Chapter 7

Gibbs, Peter; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 7-1 - 7-6; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Due to the fact that breath-holding ability in water below 15 C is considerably reduced [7]. The average breath-holding ability of a typical group of offshore workers is about 40 seconds [5], and the time for total clearance of 18 people from a typically fully loaded Super Puma helicopter is between 23 and 92 seconds [2, 3]. It is essential now to have some form of supplemental air for every crew and passenger on board a helicopter flying over water. For a detailed discussion about the implementation of an EBS system into service, please refer to Brooks and Tipton s AGARDograph AG-341 [4] and Coleshaw [6]. Over the past two decades, the three types of Emergency Breathing Systems have been increasingly put into service with helicopter operators for crew and passengers. Military helicopter aircrew very successfully pioneered the equipment. Anecdotal evidence such as the following statement has become common: ‘Without my emergency breathing system, I would not be here today’. With the increase in oil exploration, helicopter passenger flights over the sea and the media attention when one helicopter ditches and lives are lost, helicopter operators and oil companies are striving to make flight in these machines

as safe as possible. The successful track record of these systems, the increase in safety training and safety technology has now made it possible for passengers to carry these systems. It is very important for everybody who may be involved in the implementation of a system that they understand the differences and limitations of each type. The object of this paper is to broaden your knowledge and understanding of these systems.
Derived from text
Military Helicopters; Breathing Apparatus; Emergencies; Safety Devices; Crashes

20080029268 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada
The Human Factors of Surviving a Helicopter Ditching, Chapter 5
Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 5-1 - 5-12; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

When a helicopter ditches or flys in to water it commonly inverts and rapidly sinks. For the full text on the human factors related to escape and survival from a ditched helicopter please refer to the AGARDograph 305(E) by this author [2]. For all of you who attend our courses, whether aircrew, flight surgeons, SAR technicians or survival instructors, or one of the many naval trades, we must continue to be vigilant. There is no excuse for slacking off! While Chief Medical Officer for the Air Force about 12 years ago, I had to defend the requirement to continue HUET and EBS training once the new Cormorant (EH 101) maritime helicopter was introduced. I nearly lost the battle because I was arguing with a senior ex-CF104 fighter pilot who was in charge of Air Force operation - an icon to most of the more junior officers around the conference table. He was of the fatuous opinion that with three engines, it would never ditch, moreover he could not be persuaded to accept the fact that the majority of aircraft accidents are caused by some form of human error and less likely due to mechanical problems. Eventually, commonsense prevailed and I won!! Read on - the key points and updated information on helicopter ditchings are outlined in this paper.
Derived from text
Human Factors Engineering; Helicopters; Crashes; Flight Crews; Survival; Human Performance; Water; Sinks

20080029269 Portsmouth Univ., Portsmouth, UK
Fitness Requirements for Offshore Rescue, Chapter 12
Reilly, T.; Tipton, M. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 12-1 - 12-6; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Fitness standards have been employed by the police, fire fighters, industry, transport, and defence [1-7]. These standards include measures of strength, endurance, anthropometrics, flexibility, motor skills, and cardiovascular capabilities. The general approach employed to produce a scientifically underpinned and defensible fitness standard for offshore rescue was as follows: a) Identify the critical and generic tasks associated with maritime search and rescue; b) Establish minimum performance requirements for safe and successful work; c) Measure the physiological demand of these tasks (metabolic/musculoskeletal); d) Measure crew maximum performance on these tasks and on potential easy to measure predictive tests; and e) Identify the final physical fitness tests which may be a combination of predictive tests and direct work simulations.
Author
Physical Fitness; Rescue Operations; Human Performance; Sensorimotor Performance; Crews; Anthropometry; Cardiovascular System

20080029270 Survival Systems Ltd., Dartmouth, Nova Scotia, Canada
All You Need to Know About Life Jackets: A Tribute to Edgar Pask, Chapter 9B
Brooks, C. J.; Survival at Sea for Mariners, Aviators and Search and Rescue Personnel; February 2008, pp. 9B-1 - 9B-8; In English; See also 20080029256; Original contains color illustrations; Copyright; Avail.: CASI: A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

is a stone carving in the British Museum showing Assur-Nasir-Pals army crossing a river or moat to attack a castle in 870 B.C. The soldiers are wearing inflated animal skins. It may also not surprise you to know that when the Dalai Lama escaped across the Bramaputra River in 1959, he also used inflated yak skins for flotation. However, while impressments existed (that is where sailors were forcibly pressed into service in the Royal Navy), the provision of flotation devices was not encouraged. To provide a life jacket gave the sailor the potential opportunity to escape and swim ashore. The Admiralty argued that if the ship sank, there was plenty of buoyant material on which to float or cling on to, i.e. masts, spars, wooden water barrels. The

policy of impressments was not discontinued until 1815. So there was little development of the life jacket until the mid 1800s but by 1811, such features as the importance of fitting the crotch strap had been recognized in life jacket design such as Mallison s Seamen s Friend and Bathers companion. 200 years later the lesson of the crotch strap has still not been learned. Three experienced and well equipped yachtsman drowned because their life jackets failed them due to lack of a crotch strap. [9]
Derived from text
Buoyancy; Flotation; Safety; Accident Prevention; Ships

20080029377 NASA Johnson Space Center, Houston, TX, USA
The Use of Dynamic Visual Acuity as a Functional Test of Gaze Stabilization Following Space Flight
Peters, B. T.; Mulavara, A. P.; Brady, R.; Miller, C. A.; Richards, J. T.; Warren, L. E.; Cohen, H. S.; Bloomberg, J. J.; June 11, 2006; 2 pp.; In English; Seventh Symposium on the Role of the Vestibular Organs in Space Exploration, 11-14 Jun. 2006, Noordwijk, Netherlands
Contract(s)/Grant(s): NCC9-58; No Copyright; Avail.: Other Sources; Abstract Only

After prolonged exposure to a given gravitational environment the transition to another is accompanied by adaptations in the sensorimotor subsystems, including the vestibular system. Variation in the adaptation time course of these subsystems, and the functional redundancies that exist between them make it difficult to accurately assess the functional capacity and physical limitations of astro/cosmonauts using tests on individual subsystems. While isolated tests of subsystem performance may be the only means to address where interventions are required, direct measures of performance may be more suitable for assessing the operational consequences of incomplete adaptation to changes in the gravitational environment. A test of dynamic visual acuity (DVA) is currently being used in the JSC Neurosciences Laboratory as part of a series of measures to assess the efficacy of a countermeasure to mitigate postflight locomotor dysfunction. In the current protocol, subjects visual acuity is determined using Landolt ring optotypes presented sequentially on a computer display. Visual acuity assessments are made both while standing and while walking at 1.8 m/s on a motorized treadmill. The use of a psychophysical threshold detection algorithm reduces the required number of optotype presentations and the results can be presented immediately after the test. The difference between the walking and standing acuity measures provides a metric of the change in the subject s ability to maintain gaze fixation on the visual target while walking. This functional consequence is observable regardless of the underlying subsystem most responsible for the change. Data from 15 cosmo/astronauts have been collected following long-duration (approx. 6 months) stays in space using a visual target viewing distance of 4.0 meters. An investigation of the group mean shows a change in DVA soon after the flight that asymptotes back to baseline approximately one week following their return to earth. The performance of some subjects nicely parallels the stereotypical recovery curve observed in the group mean data. Others show dramatic changes in DVA from one test day to another. These changes may be indicative of a re-adaptation process that is not characterized by a steady improvement with the passage of time, but is instead a dynamic search for appropriate coordinative strategy to achieve the desired gaze stabilization goal. Ground-based data have been collected in our lab using DVA with one of the goals being to improve the DVA test itself. In one of these studies, the DVA test was repeated using a visual target viewing distance of 0.5 meters. While walking, the relative contributions of the otoliths and semi-circular canals that are required to stabilize gaze are affected by visual target viewing distance. It may be possible to exploit this using the current treadmill DVA test to differentially assess changes in these vestibular subsystems. The postflight DVA evaluations currently used have been augmented to include the near target version of the test. Preliminary results from these assessments, as well as the results from the ground-based tests will also be reported. DVA provides a direct measure of a subject's ability to see clearly in the presence of self-motion. The use of the current tests for providing a functionally relevant metric is evident. However, it is possible to expand the scope of DVA testing to include scenarios other than walking. A facility for measuring DVA in the presence of passive movements is being created. Using a mechanized platform to provide the perturbation, it should be possible to simulate aircraft and automobile vibration profiles. Used in conjunction with the far and near visual displays this facility should be able to assess a subject s ability to clearly see distant objects as well as those that appear on the dashboard or instrument control panel during functionally relevant situations.
Author
Visual Acuity; Manned Space Flight; Display Devices; Dynamic Control; Adaptation; Eye (Anatomy); Neurology

20080029985 NASA Johnson Space Center, Houston, TX, USA
Development of a Countermeasure to Enhance Postflight Locomotor Adaptability
Bloomberg, Jacob J.; May 11, 2006; 1 pp.; In English; Biomedical Engineering Seminar Series, 11-12 May 2006, Baltimore, MD, USA; No Copyright; Avail.: Other Sources; Abstract Only

Astronauts returning from space flight experience locomotor dysfunction following their return to Earth. Our laboratory

is currently developing a gait adaptability training program that is designed to facilitate recovery of locomotor function following a return to a gravitational environment. The training program exploits the ability of the sensorimotor system to generalize from exposure to multiple adaptive challenges during training so that the gait control system essentially learns to learn and therefore can reorganize more rapidly when faced with a novel adaptive challenge. We have previously confirmed that subjects participating in adaptive generalization training programs using a variety of visuomotor distortions can enhance their ability to adapt to a novel sensorimotor environment. Importantly, this increased adaptability was retained even one month after completion of the training period. Adaptive generalization has been observed in a variety of other tasks requiring sensorimotor transformations including manual control tasks and reaching (Bock et al., 2001, Seidler, 2003) and obstacle avoidance during walking (Lam and Dietz, 2004). Taken together, the evidence suggests that a training regimen exposing crewmembers to variation in locomotor conditions, with repeated transitions among states, may enhance their ability to learn how to reassemble appropriate locomotor patterns upon return from microgravity. We believe exposure to this type of training will extend crewmembers locomotor behavioral repertoires, facilitating the return of functional mobility after long duration space flight. Our proposed training protocol will compel subjects to develop new behavioral solutions under varying sensorimotor demands. Over time subjects will learn to create appropriate locomotor solution more rapidly enabling acquisition of mobility sooner after long-duration space flight. Our laboratory is currently developing adaptive generalization training procedures and the associated flight hardware to implement such a training program during regular inflight treadmill operations. A visual display system will provide variation in visual flow patterns during treadmill exercise. Crewmembers will be exposed to a virtual scene that can translate and rotate in six-degrees-of freedom during their regular treadmill exercise period. Associated ground based studies are focused on determining optimal combinations of sensory manipulations (visual flow, body loading and support surface variation) and training schedules that will produce the greatest potential for adaptive flexibility in gait function during exposure to challenging and novel environments. An overview of our progress in these areas will be discussed during the presentation.

Author

Locomotion; Adaptation; Microgravity; Manned Space Flight

20080030429 Charles River Analytics, Inc., Cambridge, MA USA

Assessing the Impact of Haptic Peripheral Displays for UAV Operators

Donmez, B; Graham, H D; Cummings, M L; Mar 2008; 71 pp.; In English

Report No.(s): AD-A479798; MIT-HAL2008-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479798

Objectives: A pilot study was conducted to investigate the effectiveness of continuous haptic peripheral displays in supporting multiple UAV supervisory control. Background: Previous research shows that continuous auditory peripheral displays can enhance operator performance in monitoring events that are continuous in nature, such as monitoring how well UAVs stay on their pre-planned courses. This research also shows that auditory alerts can be masked by other auditory information. Command and control operations are generally performed in noisy environments with multiple auditory alerts presented to the operators. In order to avoid this masking problem, another potentially useful sensory channel for providing redundant information to UAV operators is the haptic channel. Method: A pilot experiment was conducted with 13 participants, using a simulated multiple UAV supervisory control task. All participants completed two haptic feedback conditions 'continuous and threshold', where they received alerts based on UAV course deviations and late arrivals to targets. Results: Threshold haptic feedback was found to be more effective for late target arrivals, whereas continuous haptic feedback resulted in faster reactions to course deviations. Conclusions: Continuous haptic feedback appears to be more appropriate for monitoring events that are continuous in nature 'i.e., how well a UAV keeps its course'. In contrast, threshold haptic feedback appears to better support response to discrete events 'i.e., late target arrivals'. Future research: Because this is a pilot study, more research is needed to validate these preliminary findings. A direct comparison between auditory and haptic feedback is also needed to provide better insights into the potential benefits of multi-modal peripheral displays in command and control of multiple UAVs.

DTIC

Display Devices; Feedback; Situational Awareness; Touch

20080030579 Naval Postgraduate School, Monterey, CA USA

Using a Competitive Approach to Improve Military Simulation Artificial Intelligence Design

Stoykov, Sevdalin; Mar 2008; 67 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479996; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research presented in this thesis attempts to show how using a competitive approach to artificial intelligence (AI)

design can lead to improvement of the AI solutions used in military simulations. To demonstrate the potential of the competitive approach, ORTS, a real-time strategy game engine, and its competition setup are used. To justify the thesis statement, a set of exploratory experiments are conducted. The experiments represent a tournament of virtual battles between base case AIs and test case AIs. The existing OTRS clients are used as base cases, and the test cases are evolved using the competitive approach to AI design described in this work. The analysis of the results from the tournament proves the advantages of the competitive approach. At the end of the thesis, some conclusions and recommendations for future work are made.
DTIC
Artificial Intelligence; Military Technology; Simulation

20080030587 Michigan State Univ., East Lansing, MI USA
Timecourse of Recovery from Task Interruption: Data and a Model (Preprint)
Altmann, Erik M; Trafton, J G; Nov 2006; 22 pp.; In English
Contract(s)/Grant(s): N000140610077; N000140310063
Report No.(s): AD-A480013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Interruption of a complex cognitive task can entail, for the 'interuptee', a sense of having to recover afterwards. We examined this recovery process by measuring the timecourse of responses following an interruption, sampling over 13,000 interruptions to obtain stable data. Response times dropped in a smooth curvilinear pattern for the first 10 responses (15 sec or so) of post-interruption performance. We explain this pattern in terms of the cognitive system retrieving a displaced mental context from memory incrementally, with each retrieved element adding to the set of primes facilitating the next retrieval. The model explains a learning effect in our data in which the timecourse of recovery changes over blocks, and is generally consistent with current representational theories of expertise.
DTIC
Cognition; Interruption

20080030619 George Mason Univ., Fairfax, VA USA
Predicting Postcompletion Errors using Eye Movements
Ratwani, Raj M; McCurry, J M; Trafton, J G; Apr 2008; 5 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 55-8122-08
Report No.(s): AD-A480078; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A postcompletion error is a distinct type of procedural error where one fails to complete the final step of a task. While redesigning interfaces and providing explicit cues have been shown to be effective in reducing the postcompletion error rate, these methods are not always feasible or well liked. This paper demonstrates how specific eye movement measures can be used to predict when a user will make a postcompletion error. We describe a real-time eye gaze system that provides cues to the user if and only if there is a high probability of the user making a postcompletion error.
DTIC
Errors; Eye Movements; Graphical User Interface; Predictions

20080030620 Army Research Lab., Aberdeen Proving Ground, MD USA
Human Factors Evaluation of the g-MAV Micro-Air-Vehicle
Pettitt, Rodger A; Williams, Jeffrey; Jul 2007; 66 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-622716H7099
Report No.(s): AD-A480081; ARL-TR-4169; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study was conducted by the U.S. Army Research Laboratory's Human Research and Engineering Directorate in support of the Soldier Battle Lab's (SBL) micro-air vehicle (MAV) Advanced Concept and Technology Demonstration (ACTD). The MAV ACTD was a 4-year program consisting of requirements definition, technology development, integration, demonstrations, and assessments. The primary purpose of the study was to conduct a comprehensive human factors evaluation of the gas-powered version MAV (g-MAV) system. The study was conducted in conjunction with the SBL's military utility assessment (MUA) of the system. Force-on-force operational missions were conducted in order to assess the military utility of the g-MAV system. The operational missions consisted of reconnoitering a built-up area and searching a building,

conducting a route reconnaissance, and conducting an area reconnaissance. All missions were executed during the hours of daylight. The human factors engineering evaluation of the g-MAV system was accomplished during the MUA through the use of structured questionnaires, expert observations, Soldier interviews, and after-action reviews. Results demonstrate that when operating properly, the g-MAV system enhanced situational awareness by enabling Soldiers to identify and confirm enemy positions, personnel, and vehicles without exposing themselves to risk. The results also indicated several areas requiring improvement, including system reliability, durability, and operator proficiency. Specific procedures that were problematic for the Soldiers were engine tuning, reconfiguration of radios, pre-flight checks, and avionics pod interchange procedures. Recommendations were made to improve training by expanding the duration of the operator training course and restructuring the training to focus more time on areas where Soldiers demonstrated performance deficiencies.
DTIC
Education; Human Factors Engineering; Military Operations; Situational Awareness

20080030652 Defence Research and Development Canada, Toronto, Ontario Canada
Intelligent Adaptive Systems: Literature Research of Design Guidance for Intelligent Adaptive Automation and Interfaces
Banbury, Simon; Gauthier, Michelle; Scipione, Andrea; Hou, Ming; Sep 2007; 275 pp.; In English; In French; Original contains color illustrations
Contract(s)/Grant(s): W7711-067983/001/TOR
Report No.(s): AD-A480211; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Human-machine system performance can be significantly improved by using technologies that can intelligently adapt the operator machine interface (OMI) and/or task automation provided to the operator in accordance with both the external context (i.e., task environment) and internal context (i.e., operator state). However, a lack of established design guidelines presents a significant challenge to the effective design of Intelligent Adaptive Systems (IASs). An extensive literature review was conducted to examine existing approaches to the design of IASs, and a unified framework was developed to describe these design approaches using consistent and unambiguous terminology. Combining design methodologies from both Human Computer Interaction (HCI) and Human Factors (HF) fields, conceptual and design frameworks were also developed to provide guidelines for the design and implementation of IASs. Finally, a number of criteria that can be used to select appropriate analytical techniques and design approaches were also developed. The proposed frameworks not only provide guidelines for designing IASs in the military domain, but also guide the design of other generic systems to optimize human-machine system performance.
DTIC
Adaptation; Human-Computer Interface

20080030662 Naval Research Lab., Washington, DC USA
Computer-Aided Visualization in Meteorology
Trafton, J G; Hoffman, Robert R; Jan 2007; 23 pp.; In English
Report No.(s): AD-A480312; XB-NRL/MR/5510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our topic in this chapter is not so much what happens when experts have to work 'out of context,' but how cognitive engineering might help weather forecasters, in particular, remain within familiar decision-making spaces by improving on their display technology. Most weather forecasters get data, charts, and satellite images from Internet sources. In this chapter, we discuss some of what we know about how weather forecasters use information technology to display and support the interpretation of complex meteorological visualizations. Based on notions of human-centered computing (HCC), we offer some suggestions on how to improve the visualizations and tools.
DTIC
Computer Techniques; Display Devices; Meteorological Parameters; Meteorology

20080030935 NASA Johnson Space Center, Houston, TX, USA

Integration of Advanced Life Support Control Systems

Overland, David; Hoo, Karlene; Ciskowski, Marvin; February 05, 2006; 12 pp.; In English; Habitation 2006, 5-8 Feb. 2006, Orlando, FL, USA; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews some of the problems of the development and testing of automated advanced life support control systems.

CASI

Automatic Control; Life Support Systems; Systems Integration; Control Systems Design; Reliability

20080030953 Wyle Labs., Inc., Houston, TX, USA; NASA Johnson Space Center, Houston, TX, USA

Vivid Motor Imagery as an Adaptation Method for Head Turns on a Short-Arm Centrifuge

Newby, N. J.; Mast, F. W.; Natapoff, A.; Paloski, W. H.; June 07, 2006; 2 pp.; In English; Seventh Symposium on the Vestibular Organs in Space, 7-9 Jun. 2006, Noordwijk, Netherlands; Copyright; Avail.: CASI: A01, Hardcopy

Artificial gravity (AG) has been proposed as a potential countermeasure to the debilitating physiological effects of long duration space flight. The most economical means of implementing AG may be through the use of a short-radius (2m or less) centrifuge. For such a device to produce gravitational forces comparable to those on earth requires rotation rates in excess of 20 revolutions per minute (rpm). Head turns made out of the plane of rotation at these rates, as may be necessary if exercise is combined with AG, result in cross-coupled stimuli (CCS) that cause adverse side effects including motion sickness, illusory sensations of motion, and inappropriate eye movements. Recent studies indicate that people can adapt to CCS and reduce these side effects by making multiple head turns during centrifuge sessions conducted over consecutive days. However, about 25% of the volunteers for these studies have difficulty tolerating the CCS adaptation paradigm and often drop out due to motion sickness symptoms. The goal of this investigation was to determine whether vivid motor imagery could be used as a pseudostimulus for adapting subjects to this unique environment. Twenty four healthy human subjects (14 males, 10 females), ranging in age from 21 to 48 years (mean 33, sd 7 years) took part in this study. The experimental stimuli were produced using the NASA JSC short-arm centrifuge (SAC). Subjects were oriented supinely on this device with the nose pointed toward the ceiling and head centered on the axis of rotation. Thus, centrifuge rotation was in the body roll plane. After ramp-up the SAC rotated clockwise at a constant rate of 23 rpm, producing a centrifugal force of approximately 1 g at the feet. Semicircular canal CCS were produced by having subjects make yaw head turns from the nose up (NU) position to the right ear down (RED) position and from RED to NU. Each head turn was completed in about one second, and a 30 second recovery period separated consecutive head movements. Participants were randomly assigned to one of three groups (n=8 per group): physical adapters (PA), mental adapters (MA), or a control group (CG). Each subject participated in a one hour test session on each of three consecutive days. Each test session consisted of an initial (preadaptation) period during which the subject performed six CCS maneuvers in the dark, followed by an adaptation period with internal lighting on the centrifuge, and a final (postadaptation) period during which six more CCS maneuvers were performed in the dark. For the PA group, the adaptation period consisted of performing 30 additional CCS maneuvers in the light. For the MA and CG group the centrifuge was ramped down to 0 rpm after the pre-adaptation period and ramped back up to 23 rpm before the post-adaptation period. For the both of these groups, the adaptation period consisted of making 30 CCS maneuvers in the light with the centrifuge stationary (so no cross-coupling occurred). MA group subjects were instructed to vividly imagine the provocative sensations produced by the preadaptation CCS maneuvers in terms of magnitude, duration, and direction of illusory body tilt, as well as any accompanying levels of motion sickness. CG group subjects were asked to answer low imagery content questions (trivial pursuit) during each adaptation period head turn. During the 30 second recovery following each head turn, psychophysical data were collected including self reports of motion sickness, magnitude and direction estimates of illusory body tilt, and the overall duration of these sensations. A multilevel mixed effects linear regression analysis performed on all response variables indicated that all three groups experienced some psychophysical adaptation across the three test sessions. For illusory tilt magnitude, the PA group exhibited the most overall adaptation, followed by the MA group, and the CG group. The slopes of these adaptation trajectories by group over day were significantly diffent from one another. For the perceived duration of sensations, the CG group again exhibited the least amount of adaptation. However, the rates of adaptation of the PA and the MA groups were indistinguishable, suggesting that the imagined pseudostimulus appeared to be just as effective a means of adaptation as the actual stimulus. The MA group's rate of adaptation to motion sickness symptoms was also comparable to the PA group. The use of vivid motor imagery may be an effective method for adapting to the illusory sensations and motion sickness symptoms produced by cross-coupled stimuli. For space-based AG applications, this technique may prove quite

useful in retaining astronauts considered highly susceptible to motion sickness as it reduces the number of actual CCS required to attain adaptation.
Author
Head Movement; Imagery; Sensorimotor Performance; Artificial Gravity; Human Centrifuges; Centrifugal Force; Light Adaptation

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EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20080026258 NASA Johnson Space Center, Houston, TX, USA
The Rio Tinto Basin, Spain: Mineralogy, Sedimentary Geobiology, and Implications for Interpretation of Outcrop Rocks at Meridiani Planum, Mars
Fernandez-Remolar, David C.; Morris, Richard V.; Gruener, John E.; Amils, Ricardo; Knoll, Andrew H.; Earth and Planetary Science Letters; 30 Nov. 2005; ISSN 0012-821X; Volume 240, Issue 1, pp. 149-167; In English; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.epsl.2005.09.043

Exploration by the NASA rover Opportunity has revealed sulfate- and hematite-rich sedimentary rocks exposed in craters and other surface features of Meridiani Planum, Mars. Modern, Holocene, and Plio-Pleistocene deposits of the Rio Tinto, southwestern Spain, provide at least a partial environmental analog to Meridiani Planum rocks, facilitating our understanding of Meridiani mineral precipitation and diagenesis, while informing considerations of martian astrobiology. Oxidation, thought to be biologically mediated, of pyritic ore bodies by groundwaters in the source area of the Rio Tinto generates headwaters enriched in sulfuric acid and ferric iron. Seasonal evaporation of river water drives precipitation of hydronium jarosite and schwertmannite, while (Mg,Al,Fe(sup 3+))-copiapite, coquimbite, gypsum, and other sulfate minerals precipitate nearby as efflorescences where locally variable source waters are brought to the surface by capillary action. During the wet season, hydrolysis of sulfate salts results in the precipitation of nanophase goethite. Holocene and Plio-Pleistocene terraces show increasing goethite crystallinity and then replacement of goethite with hematite through time. Hematite in Meridiani spherules also formed during diagenesis, although whether these replaced precursor goethite or precipitated directly from groundwaters is not known. The retention of jarosite and other soluble sulfate salts suggests that water limited the diagenesis of Meridiani rocks. Diverse prokaryotic and eukaryotic microorganisms inhabit acidic and seasonally dry Rio Tinto environments. Organic matter does not persist in Rio Tinto sediments, but biosignatures imparted to sedimentary rocks as macroscopic textures of coated microbial streamers, surface blisters formed by biogenic gas, and microfossils preserved as casts and molds in iron oxides help to shape strategies for astrobiological investigation of Meridiani outcrops.
Author
Mars (Planet); Mars Surface; Mineralogy; Sediments; Geology; Exobiology; Sedimentary Rocks; Outcrops; Rocks

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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*.

20080029327 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Ontology for the e-Kanban Business Process
Barkmeyer, E. J.; Kulvatunyou, B.; January 2007; 89 pp.; In English
Report No.(s): PB2007-112716; NISTIR-7404; No Copyright; Avail.: CASI: A05, Hardcopy

This document details the specification for the business entities and properties that are involved in the e-Kanban business process, as defined by the Inventory Visibility and Interoperability (IV&I) program. It is these entities and properties that are the foundation for the information units that are exchanged in the standardized messages between the partner systems.
NTIS
Commerce; Standardization; Visibility

20080029336 Moser IP Law Group, Shrewsbury, NJ, USA; Sarnoff Corp., Princeton, NJ, USA
Low Latency Pyramid Processor for Image Processing Systems
Piacentino, M. R., Inventor; van der Wal, G. S., Inventor; Burt, P. J., Inventor; Bergen, J. R., Inventor; 25 May 05; 15 pp.; In English
Contract(s)/Grant(s): NBCH030074
Patent Info.: Filed Filed 25 May 05; US-Patent-Appl-SN-11-136-908
Report No.(s): PB2007-110626; No Copyright; Avail.: CASI: A03, Hardcopy

A video processor that uses a low latency pyramid processing technique for fusing images from multiple sensors. The imagery from multiple sensors is enhanced, warped into alignment, and then fused with one another in a manner that provides the fusing to occur within a single frame of video, i.e., sub-frame processing. Such sub-frame processing results in a sub-frame delay between a moment of capturing the images to the display of the fused imagery.

NTIS
Image Processing; Patent Applications; Pyramids

20080029344 Greer, Burns and Crain, Chicago, IL, USA; Illinois Univ., Urbana-Champaign, IL, USA
Methods and Systems for Computer Based Collaboration
Goldberg, D. E., Inventor; Welge, M. E., Inventor; Llora, X. F., Inventor; 2 May 05; 19 pp.; In English
Contract(s)/Grant(s): ONR-N00014-01-1-0175; AFOSR-F49620-03-1-0129
Patent Info.: Filed Filed 2 May 05; US-Patent-Appl-SN-11-119-636
Report No.(s): PB2007-110692; No Copyright; Avail.: CASI: A03, Hardcopy

An exemplary method for computer based collaboration between a plurality of participants communicating over a data network comprises steps of receiving communications data with the computer, using a text analysis tool to identify at least a plurality of k-words from the communications data and a plurality of relations linking at least a portion of the plurality of k-words, and displaying the k-words and relations to the plurality of participants over the computer network.

NTIS
Patent Applications; Computer Networks; Computer Programs; Communicating

20080029347 Luckacher (K. J.), Rochester, NY, USA
Imaging Using a Multifocal Aspheric Lens to Obtain Extended Depth of Field
George, N., Inventor; Chi, W., Inventor; 16 Jun 05; 24 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0551
Patent Info.: Filed Filed 16 Jun 05; US-Patent-Appl-SN-11-154-121
Report No.(s): PB2007-110688; No Copyright; Avail.: CASI: A03, Hardcopy

A system for imaging with a circularly symmetric multifocal aspheric lens is provided for obtaining an extended depth of field. The system includes a camera for capturing an image of at least one object through a circularly symmetric multifocal aspheric lens to provide a blurred image, and a computer system for processing the captured blurred image to provide a recovered image of the object having an extended depth of field. The recovered image may be outputted to a display or other peripheral device. Processing of the blurred image utilizes one of inverse filtering, convolution matrix (e.g., edge sharpening matrix), or maximum entropy. The computer system performing image processing may be in the camera or represent a computer system external to the camera which receives the blurred image. The extended depth of field is characterized by the object being in focus over a range of distances in the recovered image.

NTIS
Depth; Imaging Techniques; Lenses; Patent Applications

20080029351 Bureau of the Census, Washington, DC, USA
Distribution-Preserving Statistical Disclosure Limitation
Woodcock, S. D.; Benedetto, G.; Sep. 2006; 45 pp.; In English
Report No.(s): PB2007-113236; TP-2006-04; No Copyright; Avail.: CASI: A03, Hardcopy

One approach to limiting disclosure risk in public-use microdata is to release multiply-imputed, partially synthetic data sets. These are data on actual respondents, but with con.dential data replaced by multiply-imputed synthetic values. A mis-specified imputation model can invalidate inferences because the distribution of synthetic data is completely determined by the model used to generate them. We present two practical methods of generating synthetic values when the imputer has only limited information about the true data generating process. One is applicable when the true likelihood is known up to a

monotone transformation. The second requires only limited knowledge of the true likelihood, but nevertheless preserves the conditional distribution of the confidential data, up to sampling error, on arbitrary subdomains. Our method maximizes data utility and minimizes incremental disclosure risk up to posterior uncertainty in the imputation model and sampling error in the estimated transformation. We validate the approach with a simulation and application to a large linked employer-employee database.
NTIS
Privacy; Computer Information Security; Statistical Analysis

20080029352 Bureau of the Census, Washington, DC, USA
Multiply-Imputing Confidential Characteristics and File Links in Longitudinal Linked Data
Abowd, J. M.; Woodcock, S. D.; Jun. 2004; 10 pp.; In English
Report No.(s): PB2007-113240; TP-2004-04; No Copyright; Avail.: CASI: A02, Hardcopy

This paper describes ongoing research to protect confidentiality longitudinal linked data through creation of multiply-imputed, partially synthetic data. We present two enhancements to the methods. The first is designed to preserve marginal distributions in the partially synthetic data. The second is designed to protect confidential links between sampling frames.
NTIS
Computer Information Security; Augmentation

20080030128 Institute for Law and Justice, Alexandria, VA, USA
Everett, Washington, Arrest Policies Project: A Process Evaluation
Spence, D. L.; Oct. 04, 2000; 45 pp.; In English
Contract(s)/Grant(s): NCJRS-98-WE-VX-0012
Report No.(s): PB2007-113160; No Copyright; Avail.: CASI: A03, Hardcopy

The Grants to Encourage Arrest Policies Program encourages jurisdictions to implement mandatory or pro-arrest policies as an effective domestic violence intervention that is part of an coordinated community response. Congress appropriated funds for the Arrest Program under the Violence Against Women Act (1994). The Program assumes that the arrest of a batterer will leverage the coercive and persuasive power of the criminal justice system to ensure victim safety and manage the behavior of abusive, violent offenders. Ensuring victim safety and offender accountability are the guiding principles underlying the Grants to Encourage Arrest Policies. The Violence Against Women Act directs that the Arrest Program funds be used to: Implement mandatory arrest or pro-arrest programs and policies in police departments, including mandatory arrest programs or pro-arrest program and policies for protective order violations; Develop policies and training programs in police departments and other criminal justice and tribal agencies to improve tracking of cases involving domestic violence; Centralize and coordinate police enforcement, prosecution, probation, parole or judicial responsibility for domestic violence cases in groups or units of police officers, prosecutors, probation and parole officers or judges; Coordinate computer tracking systems to ensure communication between police, prosecutors, and both criminal and family courts; Strengthen legal advocacy service programs for victims of domestic violence by providing complete information and support for a victim of domestic violence as the case against her abuser moves through the criminal justice system; Educate judges and others responsible for judicial handling of domestic violence cases, in criminal, tribal, and other courts about domestic violence to improve judicial handling of such cases.
NTIS
Policies; Violence; Police

20080030129 Institute for Law and Justice, Alexandria, VA, USA
Brockton, Massachusetts, Arrest Policies Project: A Process Evaluation
Spence, D. L.; Sep. 22, 2000; 24 pp.; In English
Contract(s)/Grant(s): NCJRS-98-WE-VX-0012
Report No.(s): PB2007-113159; No Copyright; Avail.: CASI: A03, Hardcopy

The Grants to Encourage Arrest Policies Program encourages jurisdictions to implement mandatory or pro-arrest policies as an effective domestic violence intervention that is part of a coordinated community response. Congress appropriated funds for the Arrest Program under the Violence Against Women Act (1994). The Program assumes that the arrest of a batterer will leverage the coercive and persuasive power of the criminal justice system to ensure victim safety and manage the behavior of abusive, violent offenders. Ensuring victim safety and offender accountability are the guiding principles underlying the Grants to Encourage Arrest Policies. The Violence Against Women Act directs that the Arrest Program funds be used to:

Implement mandatory arrest or pro-arrest programs and policies in police departments, including mandatory arrest programs or pro-arrest program and polices for protection order violations; Develop policies and training programs in police departments and other criminal justice and tribal agencies to improve tracking of cases involving domestic violence; Centralize and coordinate police enforcement, prosecution, probation, parole or judicial responsibility for domestic violence cases in groups or units of police officers, prosecutors, probation and parole officers or judges; Coordinate computer tracking systems to ensure communication between police, prosecutors, and both criminal and family courts; Strengthen legal advocacy service programs for victims of domestic violence by providing complete information and support for a victim of domestic violence as the case against her abuser moves through the criminal justice system; Educate judges, and others responsible for judicial handling of domestic violence cases, in criminal, tribal, and other courts about domestic violence to improve judicial handling of such cases.
NTIS
Policies; Violence; Police; Protection

20080030139 Institute for Law and Justice, Alexandria, VA, USA
First Judicial District, Arrest Policies Project: Santa Fe, New Mexico
DuPree, C.; Feb. 10, 2000; 24 pp.; In English
Contract(s)/Grant(s): NCJRS-98-WE-VX-0012
Report No.(s): PB2007-113161; No Copyright; Avail.: CASI: A03, Hardcopy

The Grants to Encourage Arrest Policies Program encourages jurisdictions to implement mandatory or pro-arrest policies as an effective domestic violence intervention that is part of an coordinated community response. Congress appropriated funds for this program under the Violence Against Women Act (1994). The Program assumes that the arrest of a batterer will leverage the coercive and persuasive power of the criminal justice system to ensure victim safety and manage the behavior of abusive, violent offenders. Ensuring victim safety and offender accountability are the guiding principles underlying the Grants to Encourage Arrest Policies. The Violence Against Women Act directs that the Arrest Program funds be used to: Implement mandatory arrest or pro-arrest programs and policies in police departments, including mandatory arrest programs or pro-arrest program and policies for protection order violations; Develop policies and training programs in police departments and other criminal justice and tribal agencies to improve tracking of cases involving domestic violence; Centralize and coordinate police enforcement, prosecution, probation, parole or judicial responsibility for domestic violence cases in groups or units of police officers, prosecutors, probation and parole officers or judges; Coordinate computer tracking systems to ensure communication between police, prosecutors, and both criminal and family courts; Strengthen legal advocacy service programs for victims of domestic violence by providing complete information and support for a victim of domestic violence as the case against her abuser moves through the criminal justice system; Educate judges and others responsible for judicial handling of domestic violence cases, in criminal, tribal, and other courts about domestic violence to improve judicial handling of such cases.
NTIS
Policies; Violence; Protection; Police

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COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20080030384 Army Research Lab., Aberdeen Proving Ground, MD USA
The Effects of Symbol Size and Workload Level on Status Awareness of Unmanned Ground Vehicles
Lockett, III, John F; Apr 2007; 68 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479634; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479634

The objective of this study was to determine which size symbols should be used by the U.S. Army for an operator control unit to indicate the status of unmanned ground vehicles (UGVs). Twelve participants were asked to watch the symbols on a map display and touch one of four UGV symbols when it stopped moving. Different numbers of distracter symbols with the same height as the UGV symbols appeared during the experimental trials. The time to notice that a UGV symbol had stopped (recognition time) and to touch the screen (response time) were measured. Participants were asked for Subjective Workload Assessment Technique (SWAT) ratings for each combination of symbol size and number of distracter symbols. Errors committed while attempting to touch the correct symbol were counted. Results for the time and error measures were as

expected for changes in symbol size. As symbol size increased, recognition time, response time, and extra touches decreased. Significant differences were seen in these measures. Also, as expected, subjective mental workload increased as symbol size decreased, with differences seen between all symbol size levels. No significant differences were observed for workload manipulation (number of distracter symbols) as measured by time and error. However, SWAT scores did show a significant difference as a result of number of distracters. The differences between 0 and 8 distracters and between 0 and 12 distracters were significant. There was no significant interaction between symbol size and number of distracters for any of the measures. Overall results suggest that symbols smaller than those recommended for keypads may be sufficient for interactive map displays. For static platforms with bare-handed operators, symbols that subtend 40 minutes of arc may be sufficiently large to ensure adequate touch screen performance under low to moderate workload conditions.
DTIC
Graphical User Interface; Human Factors Engineering; Remote Control; Symbols; Unmanned Ground Vehicles; Workloads (Psychophysiology)

20080030611 Naval Postgraduate School, Monterey, CA USA
Implementation of a Cyclostationary Spectral Analysis Algorithm on an SRC Reconfigurable Computer for Real-Time Signal Processing
Upperman, Gary J; Mar 2008; 124 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480065; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This thesis describes a near-real-time method of detecting low probability of intercept (LPI) emissions. A cyclostationary spectral analysis algorithm developed by the Center for Joint Services Electronic Warfare at the Naval Postgraduate School was implemented on the SRC-6 reconfigurable computer. This thesis is part of a larger project investigating the use of the SRC-6 for electronic intelligence detection and processing. Cyclostationary processing transforms a received signal into a frequency-cycle frequency domain which can have detection advantages over a time-frequency domain transformation. When performed at near-real-time processing speed, the algorithm can be used to detect and classify LPI emissions. The performance of the algorithm on the SRC-6 is compared to equivalent implementations in MATLAB and the C programming language.
DTIC
Algorithms; Architecture (Computers); Computers; Real Time Operation; Reconfigurable Hardware; Signal Processing; Spectrum Analysis

20080030657 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Digital Signal Processing Leveraged for Intrusion Detection
Erickson, Theodore J; Mar 27, 2008; 106 pp.; In English
Report No.(s): AD-A480262; AFIT/GCE/ENG/08-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This thesis describes the development and evaluation of a novel system called the Network Attack Characterization Tool (NACT). The NACT employs digital signal processing to detect network intrusions, by exploiting the Lomb-Scargle periodogram method to obtain a spectrum for sampled network traffic. The Lomb-Scargle method for generating a periodogram allows for the processing of unevenly sampled network data. The spectrum is examined to determine if features exist above a significance level chosen by the user. These features are considered an attack, triggering an alarm. Two traffic statistics are used to construct the time series over which the periodogram analysis is accomplished. These two statistics are packet inter-arrival time and payload size. Three specific attacks from this data set are examined; the Processtable attack, the Dictionary attack and the Teardrop attack. Of the three attacks the NACT was able to detect the Processtable attack with an accuracy of 100%. The Dictionary and Teardrop attacks were also detected with 100% and 85% accuracies respectively. This success in detecting these attacks establishes that digital signal processing methods can be a successful technique for network intrusion detection.
DTIC
Detection; Digital Systems; Networks; Signal Processing; Warning Systems

20080030877 Dartmouth Coll., Hanover, NH USA
Real World Cognitive Multi-Tasking and Problem Solving: A Large Scale Cognitive Architecture Simulation Through High Performance Computing-Project Casie
Santos, Jr , Eugene; McEvoy, Kiley; Abu-Ghazaleh, Nael; Kolar, Vinay; Zhang, Mark; Guo, Zhen; Mar 2008; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-05-2-0284; Proj-558B
Report No.(s): AD-A480207; No Copyright; Avail.: Defense Technical Information Center (DTIC)
In its grandest sense, Project CASIE explored the development of a computational system capable of high level perception

and problem solving that reflects the cognitive processes of the human brain. Most specifically, it concentrated on better understanding and modeling intuition and insight in a computational fashion. The goal was to address the fundamental problem of modeling and solving communities of tasks from a cognitive point of view through multiple problem solving agents working cooperatively or competitively on different subtasks at multiple levels of granularity.
DTIC
Cognition; Problem Solving; Simulation

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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.

20080030117 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Modeling Activities for NASA's James Webb Space Telescope (JWST), 4, Overview and Introduction of Matlab Based Toolkits used to Interface with Optical Design Software
Howard, Joseph; September 24, 2007; 1 pp.; In English; SPIE Optics and Photonics meeting, 26-30 Aug. 2007, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This is part four of a series on the ongoing optical modeling activities for James Webb Space Telescope (JWST). The first two discussed modeling JWST on-orbit performance using wavefront sensitivities to predict line of sight motion induced blur, and stability during thermal transients. The third investigates the aberrations resulting from alignment and figure compensation of the controllable degrees of freedom (primary and secondary mirrors), which may be encountered during ground alignment and on-orbit commissioning of the observatory. The work here introduces some of the math software tools used to perform the work of the previous three papers of this series. NASA has recently approved these in-house tools for public release as open source, so this presentation also serves as a quick tutorial on their use. The tools are collections of functions written in Matlab, which interface with optical design software (CodeV, OSLO, and Zemax) using either COM or DDE communication protocol. The functions are discussed, and examples are given.
Author
James Webb Space Telescope; Computer Programs; Numerical Analysis; Software Development Tools; Optical Data Processing

20080030388 Saint Andrew's Univ., UK
Development of New Methods and Software for Distance Sampling Surveys of Cetacean Populations
Thomas, Len; Borchers, David L; Rexstad, Eric; Buckland, Stephen T; Bravington, Mark L; Wood, Simon N; Hedley, Sharon L; Gordari, Johnathan; Gillespie, Douglas; Matthews, Justin; Peel, David; Mar 2008; 36 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0661
Report No.(s): AD-A479648; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479648

Obtaining reliable estimates of the density and distribution of cetacean species is an essential component of a risk mitigation strategy, as well as having other conservation and management uses. The overall goal of this research program was to develop statistical methods and software that substantially enhances the utility and robustness of current survey methods. To achieve this, four research projects were undertaken, to develop methods for: 1) analysis of towed passive acoustic and combined visual-acoustic surveys; 2) improved modeling of animal distribution from survey data; 3) improved modeling of spatial distribution of group size (for animals that cluster); and 4) more efficient survey designs that utilize information from the above models to direct sampling. Here, we report our findings, list the research outputs and give recommendations for future research directions.
DTIC
Conservation; Ecology; Marine Mammals; Populations; Sampling; Surveys

20080030391 Naval Postgraduate School, Monterey, CA USA
The Use of Concept Maps for the Diffusion of the Distributed Operations Concept and the Dissemination of Existing Virtual Training Simulations
Boone, Brian S; Mar 2008; 89 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479668; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479668

The Marine Corps finds itself increasingly fighting an elusive, adaptive and decentralized enemy. Facing this type of

decentralized enemy suggests the Marine Corps embrace a more decentralized approach to conventional military operations. One of the strategies that the USMC has been introducing is Distributed Operations (DO) that will enable meeting the need of commanders to fight a highly decentralized engagement. DO require that the Marine Corps add to its conventional skills the additive ability to decentralize decision making and an ability to distribute the force when it is tactically advantageous to do so. Lessons learned from the Hunter Warrior series of experiments suggest that technology can only be effectively applied once assigned tasks have been mastered In order for the Marine Corps to enable DO capability throughout the Marine Corps, a proactive information campaign must be conducted. The thesis seeks to develop a web based collaboration tool which will link critical DO specific and conventional skills to the current simulations which train them This will serve to increase all Marines' understanding of the requisite knowledge and introduce novel training opportunities that exist as the concept of DO is concurrently developed.
DTIC
Computer Assisted Instruction; Diffusion; Education; Simulation; Virtual Reality

20080030399 Army Research Lab., Adelphi, MD USA
The Implementation of a Python Class for Structuring Network Data Collected in a Test Bed
Nguyen, Binh Q; Apr 2008; 30 pp.; In English
Report No.(s): AD-A479698; ARL-TR-4423; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479698

This report documents an internally developed Python class that takes in a set of data files and organizes them into effective data structures that are suitable for the subsequent extraction, processing, and analysis. The report includes usage examples by describing Python snippets that perform statistical calculations and that transform the data into comma-separated values. Sample input and output data are appended to the report.
DTIC
Data Processing; Test Stands

20080030403 Naval Postgraduate School, Monterey, CA USA
An Attacker-Defender Model for IP-Based Networks
Barkley, Timothy R; Mar 2008; 79 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479714; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479714

The Internet Protocol (IP) has emerged as the dominant technology for determining how data is routed across the Internet. Because IP flows are defined essentially in terms of origin-destination (O-D) pairs, we represent IP traffic engineering as a multi-commodity flow problem in which each O-D pair is treated as a separate commodity. We account for the diversity in IP routing by modeling opposite extremes of traffic engineering: naive traffic engineering where the IP routes data between any two users using only the shortest path between them, and best case traffic engineering where IP has the flexibility to route data using multiple paths in the network regardless of their length. We develop linear programming formulations that identify the maximum data flow for an IP network that satisfies proportionality constraints for traffic demand for each case of traffic engineering, and we also determine the optimal interdiction of those flows that reduces that maximum flow in the worst possible way.
DTIC
Commodities; Data Processing; Internets; Linear Programming; Networks; Protocol (Computers)

20080030419 Carnegie-Mellon Univ., Pittsburgh, PA USA
Moving Up the CMMI Capability and Maturity Levels Using Simulation
Raffo, David M; Wakeland, Wayne; Jan 2008; 131 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A479755; CMU/SEI-2008-TR-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479755

Process Simulation Modeling (PSIM) technology can be used to evaluate issues related to process strategy, process improvement, technology and tool adoption, project management and control, and process design. Recent developments in PSIM tools have drastically cut the costs to develop models for evaluating such issues, and new methods have been developed to apply PSIM, enabling it to provide greater business value. At the same time, trends within the software industry towards

improving operations and reducing costs have heightened the need for tools to better plan and manage processes. As a result, organizations regard PSIM as an attractive tool that can provide business value today. This report shows examples of how PSIM has been implemented within industry and government organizations to improve process consistency and results. The report also shows, via many examples, exactly how PSIM supports Capability Maturity Model Integration Process Areas from level 2 through level 5.
DTIC
Computer Programming; Computerized Simulation; Management Planning; Project Management; Risk; Simulation; Software Engineering

20080030425 Naval Postgraduate School, Monterey, CA USA
Littoral Combat Ship (LCS) Mission Packages: Determining the Best Mix
Abbott, Benjamin P; Mar 2008; 135 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479783; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479783

The threat of a large fleet engagement in the open ocean is currently over-shadowed by the asymmetric challenges presented by state and non-state actors using the littorals for illicit purposes. Unlike traditional multimission combatants, the Littoral Combat Ship (LCS) is a focused mission platform significantly less capable of handling simultaneous missions, whether they are planned or not. However, when deploying LCS as a squadron, a Combatant Commander may select to equip multiple LCS platforms with a mix of focused mission packages to ensure operational success across the broad range of challenges associated with littoral warfare. Through the use of simulation, design of experiments, and data analysis, this thesis simulated 41,195 littoral operations to determine how many LCSs should constitute an employed squadron, what the composition of a squadron should be, and how sensors and weapon systems can contribute to the effectiveness of an employed squadron. The results indicate that a squadron size of 6-10 LCSs would produce the best results, and that a compositional rule of thumb of 5 LCSs for the primary threat and 2 LCSs for the secondary threat should apply to each warfare area. The number of casualties suffered in each warfare area reinforces the danger associated with littoral combat and serves as a reminder that close engagement, while necessary, carries a cost.
DTIC
Antisubmarine Warfare; Combat; Navy; Ships; Simulation; Warfare

20080030427 Carnegie-Mellon Univ., Pittsburgh, PA USA
Using Aspect-Oriented Programming to Enforce Architecture
Merson, Paulo; Sep 2007; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A479786; CMU/SEI-2007-TN-019; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479786

Using aspect-oriented programming (AOP), software developers can define customized compile-time error or warning messages that are issued when the code contains join points that match specified pointcuts. These customized messages are generated by compiletime declarations, which are an extremely simple but powerful AOP mechanism. Declarations that look for nonvalid interactions between modules can be used for architecture enforcement. Coding policies, best practices, design patterns, and code-naming conventions can also be enforced. Compile-time declarations operate as an additional verification in the build process, but they do not affect the compiled application and can be turned on and off at any time. That feature makes this approach an automated and nondisruptive solution for architecture enforcement and a risk-free first step towards AOP adoption.
DTIC
Architecture (Computers); Computer Programming; Object-Oriented Programming

20080030433 Carnegie-Mellon Univ., Pittsburgh, PA USA

Basic Principles and Concepts for Achieving Quality

Baker, Emanuel R; Fisher, Matthew J; Goethert, Wolfhart; Marino, Lisa; Dec 2007; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F19628-00-C-0003

Report No.(s): AD-A479804; CMU/SEI-2007-TN-002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479804

This technical note extends the quality concepts first articulated in 'A Software Quality Framework' (SQF) developed in the early 1980s for the Department of Defense (DoD) by Baker and colleagues. The original quality concepts of the SQF are extended beyond software to include products, services, and processes. This technical note also describes the conceptual elements necessary for building quality into systems, or any entity, and evaluating the quality actually achieved. The technical note presents definitions and conceptual elements within the context of Capability Maturity Model Integration (CMMI) to show how CMMI codifies the concepts. Another goal of including the CMMI context is to help CMMI implementers recognize the purpose of some CMMI components relative to quality concepts and principles, and to help ensure a CMMI implementation leading to quality products. The definitions provided are the structural members of this extended framework, which lay the basis for establishing quality requirements, methods to help satisfy these requirements, and quality evaluation. DTIC

Computer Programming; Computer Programs; Evaluation; Quality Control; Software Engineering; System Effectiveness

20080030437 Naval Postgraduate School, Monterey, CA USA

A Novel Project Management Theory and Its Applicability

Erguner, Abdulkerim; Mar 2008; 113 pp.; In English

Report No.(s): AD-A479817; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479817

Software Project Management is an emerging discipline. The software project manager's job comprises every aspect of the project from starting the project to closing out. Practitioners of the discipline use several project management tools in managing diverse aspects of their projects. However, there is no existing management theory that combines different aspects of a software project and results in a complete picture. This study discusses a management theory and modeling language that combine several management aspects of software projects into concrete models to aid the software project manager. The mathematical relations and graphical models derived from the theory consist of entire entities and activities of a project as determined by the project team, and they depict any kind of relationship between the entities and activities, including stakeholders. The theory provides a mathematical model for software projects and the modeling language provides graphical models of software projects representing the mathematical model. This study tests the applicability of the theory and the modeling language in two case studies. The results indicate that the theory and modeling language are applicable to real world projects, and that they show promise as valuable software project management tools. DTIC

Computer Programming; Computer Programs; Languages; Management Planning; Mathematical Models; Project Management; Simulation; Software Development Tools; Software Engineering

20080030451 Army Tank-Automotive Research and Development Command, Warren, MI USA

Embedded Simulation Overview

Lohrer, Scott; Apr 10, 2008; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479836; TARDEC-18802; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479836

Embedded Simulation Technologies: Warfighter machine interfaces (WMI); Human Performance Modeling: Modeling of human workload issues; Distributed Simulation Activities: Virtual battlefield simulations. DTIC

Embedding; Simulation

20080030458 Army Tank-Automotive Research and Development Command, Warren, MI USA
Virtual Combat Vehicle Experimentation for Duty Cycle Measurement
Brudnak, Mar; Pozolo, Mike; Meldrum, AnnMarie; Mortsfield, Todd; Shvartsman, Andrey; Smith, Wilford; Goodell, Jarrett; Holtz, Dale; Apr 16, 2008; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479847; TARDEC-18815; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479847

Experiment Purpose: To measure the duty cycle of a Future Combat Systems (FCS) Mounted Combat System (MCS) in a relevant scenario; Build a high fidelity representation of the vehicle and power system; Bring in professional operators to run the simulation; Operate in real time with the P&E SIL by integrating it over the Internet.
DTIC
Combat; Computerized Simulation

20080030463 Southwest Research Inst., San Antonio, TX USA
A General Purpose Vehicle Powertrain Modeling and Simulation Software - VPSET (Preprint)
Nedungadi, Ashok; Pozolo, Mike; Mimnagh, Mike; Feb 8, 2008; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479856; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479856

VPSET (Vehicle Powertrain Systems Evaluation Tool) is vehicle modeling and simulation software to analyze performance and fuel economy of conventional and hybrid powertrains. VPSET has a Graphical User Interface (GUI) to guide the user during building a vehicle model. This paper discusses VPSET, its organization, structure, vehicle templates and presents validation results for select vehicles.
DTIC
Computerized Simulation; Engine Parts; Fuel Systems

20080030568 Naval Postgraduate School, Monterey, CA USA
Statistical Debugging
Murphy, Toriano A; Mar 2008; 109 pp.; In English
Report No.(s): AD-A479960; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Software debugging is a time consuming and important step in the development and evolution of software systems. Debugging is a practice that normally gets the least praise but normally requires the most attention and effort. The aim of debugging is to find and reduce the number of faults in a program, thereby making a program behave the way it is expected. Even with the advances that have been made with computer speed, graphical user interfaces, networking abilities and storage capabilities the cost of debugging remains high. The aim of this thesis is to build on the process of debugging using a statistical approach. Statistical debugging is not a new phenomenon, but a statistical debugging technique has been developed to assist in addressing the difficulties of isolating faults in software. The tool developed for debugging by this thesis will save time and effort in finding faults thereby saving money.
DTIC
Program Verification (Computers)

20080030569 Naval Postgraduate School, Monterey, CA USA
Adapting the Dynamic Allocation of Fires and Sensors (DAFS) Model for Use in Maritime Combat Analysis
Hattaway, Scott B; Mar 2008; 143 pp.; In English
Report No.(s): AD-A479962; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Navy employs several models of maritime combat to provide analytical rigor to force structure and weapon system procurement policies. All of the models currently used are high resolution and deterministic, providing very detailed results but without any measurement of variance or any statistical manner of evaluating risk. This thesis provides the initial groundwork for a low resolution stochastic maritime combat model that may provide an initial evaluation and shape future detailed studies. The framework for the model is a Discrete Event Simulation (DES) Model fed by Extensible Mark-up Language (XML) input and output modules. The simulation loads scenario inputs from XML files forming the baseline values of entities, the rules employed for movement and combat, and the general concept of the scenario. During simulation run, the model makes intermittent calls to an optimization package to allocate weapons based on a multidimensional knapsack problem simulating a networked force. Upon completion of the simulation run, the model generates an XML output that can be later

read for statistical analysis and data mining. Because of the stochastic nature of the model, it provides an increased level of analytical quality to its results as well as the ability to calculate the risk involved with the force structure and units employed.
DTIC
Allocations; Combat; Computerized Simulation; Fires; Support Systems

20080030576 Soar Technology, Inc., Ann Arbor, MI USA
Cultural Behavior Generation
Reece, Douglas A; Taylor, Glenn; Apr 2008; 56 pp.; In English
Contract(s)/Grant(s): W91WAW-07-P-0252
Report No.(s): AD-A479977; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Virtual training environments need culturally-appropriate human behavior simulations to train U.S. Army personnel to accomplish military tasks in foreign environments. We surveyed existing cultural behavior models and systems, identifying promising concepts that can be incorporated into a cultural cognitive architecture. We considered different training applications and identified a 'knock-and-talk' house visitation scenario as representative of scenarios that require cultural awareness on the part of a trainee, yet avoided open-ended interaction between the trainee and the environment. We developed the core concept for a cultural cognitive architecture based on the incorporation of a behavior schema recognition and processing mechanism into an existing cognitive model. This technical approach was demonstrated in a functional prototype that linked the cognitive behavior model with a high fidelity physical behavior model. We also investigated how these models could be applied in a distributed simulation environment and how they could be integrated into OneSAF. This report details these Phase I project accomplishments.
DTIC
Combat; Education; Simulation; Virtual Reality

20080030585 Alpha STAR Corp., Long Beach, CA USA
Technical Approach for Coupled Reliability-Durability Assessment of Army Vehicle Sub-Assemblies
Abumeri, Galib; Garg, Mohit; Lamb, David A; Apr 2008; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480010; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The US Army is seeking to advance simulation methods for assessing the performance and reliability of ground vehicles. The reliability is defined as the probability that the Army vehicle performs its function over a specified period of time and under specified loading conditions; it can be viewed as a measure of successful performance of the component, sub-assembly and eventually whole vehicle. For the structural reliability calculation to be meaningful, it must be coupled with durability evaluation. The durability describes the ability of the structure to endure or resist applied loading. Maximum benefit would be obtained when both the reliability and durability are maximized. Such an outcome is highly desired, especially if it is achieved at low cost and low weight.
DTIC
Computerized Simulation; Durability; Prediction Analysis Techniques; Reliability

20080030586 Naval Research Lab., Washington, DC USA
RE Theory Meets Software Practice: Lessons from the Software Development Trenches
Heitmeyer, Constance; Jeffords, Ralph; Bharadwaj, Ramesh; Archer, Myla; Oct 2007; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480012; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Based on our recent experience in four projects, each focused on either security-critical or safety-critical software, this paper evaluates several notions, widely held by Requirements Engineering researchers, for their utility in practical software development. It describes four notions which in our view work in practice and five others which do not.
DTIC
Computer Programming; Requirements; Software Engineering

20080030592 Naval Postgraduate School, Monterey, CA USA
ELINT Signal Processing Using Choi-Williams Distribution on Reconfigurable Computers for Detection and Classification of LPI Emitters
Upperman, Teresa L O; Mar 2008; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480021; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis documents the use of the SRC-6 Reconfigurable Computer for use in analyzing low probability of intercept

(LPI) signals using the Choi-Williams distribution. The SRC-6 is a reconfigurable computer manufactured by SRC Computers, Inc. which allows the user to tailor both the software and the hardware to a specific task. This increases the speed at which the task can be accomplished making it useful for applications in electronic intelligence (ELINT). The Choi-Williams distribution is a mathematical technique that was first created using MATLAB and then converted to C code for use on the SRC-6. The purpose of this study is to investigate the feasibility of using a reconfigurable computer for ELINT applications and the timely detection and classification of LPI signals. This thesis is part of a larger study to use reconfigurable computers for the autonomous detection and classification of LPI signals.
DTIC
Classifications; Computer Programs; Emitters; Reconfigurable Hardware; Signal Processing

20080030597 Naval Postgraduate School, Monterey, CA USA
A Comparative Analysis of Fortress (ES520) and Mesh Dynamics' (4000 Series) Networking Capabilities During Coasts 2007 Field Experiments
Tyler, Brian K; Mar 2008; 177 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480032; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Cooperative Operations and Applied Science & Technology Studies (COASTS) field experimentation program is a combined Indonesia-Malaysia-Singapore-Thailand-U.S. research and development (R&D) effort to test commercial-off-the-shelf (COTS) Command and Control, Communications Computers and Intelligence, Surveillance and Reconnaissance (C4ISR) technologies to provide real-time situational awareness (SA) for multi-national, tactical and remote decision makers in a cooperative environment. This thesis evaluated the military suitability of Fortress 802.11 ES520 wireless technology and Mesh Dynamics 4000 series 802.11 wireless technology by conducting a comparative analysis of the technologies network performance while deployed in a tactical ground, maritime and mobile configuration in support of COASTS 2007 field experiments. Several operational field tests were conducted in California and Thailand in order to evaluate both Mesh Modules and ES520s network performances. Specific military suitability areas evaluated included network availability, throughput, network security, graphical user interface, transportability, connectivity, environmental effects, peripheral support, encryption performance, AP to AP handoff capability and antenna configuration.
DTIC
Coasts; Computers; Graphical User Interface; Networks; Telecommunication

20080030600 Naval Postgraduate School, Monterey, CA USA
A Framework for Software Reuse in Safety-Critical System of Systems
Warren, Bradley R; Mar 2008; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480036; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This thesis concerns the effective and safe software reuse in safety-critical system-of-systems. Software reuse offers many unutilized benefits such as achieving rapid system development, saving resources and time, and keeping up technologically in an increasingly advancing global environment. System software needs to be designed for both reuse and safety and available information shared effectively. We introduce a process neutral framework for software reuse in safety-critical system of systems. That framework consists of four elements: organizational factors, component attributes, component specification, and safety analysis. We developed a model (C5RA) to capture the relevant component information and assist in specification matching. We conducted a survey of software safety metrics, created metrics, and developed a ranking. We applied the framework utilizing the reuse of a generic avionics software component. Our key findings are that congruence between all elements is required; software should posses certain attributes with metrics that support a safe design; software component information can be specified using C5RA; and a process was identified for a system-of-systems hazard analysis for software reuse. The framework outlined provides a solution that enables effective software reuse in safety-critical system of systems.
DTIC
Safety; Software Reuse; Systems Engineering

20080030615 Naval Postgraduate School, Monterey, CA USA
An Investigation of Communications Architecture Impact on Combat Effectiveness Using the Naval Simulation System
Hakewessell, Peter C; Mar 2008; 75 pp.; In English
Report No.(s): AD-A480071; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This research study evaluates the ability of the Naval Simulation System (NSS) to model how changes in communication architecture for a given scenario contribute to combat effectiveness. The scenario used for this study models communication

capability associated with the Marine Corps Warfighting Lab, Sea Viking 06 distributed operations scenario using the NSS. In addition, an evaluation of alternative system configurations in the communication structure is obtained in order to determine how bandwidth constraints on specific systems limit mission effectiveness. The NSS is a multi-warfare mission area tool designed to support operational commanders in developing and analyzing operational courses of action at the group/force level. Recent evolutionary changes now provide the NSS the ability to perform communication analysis of routed and circuit switched systems in addition to course of action analysis of modifiable assets in a programmed scenario. This capability makes the NSS unique among modeling and simulation tools. The simulation model experiment contains seven communication architectures with progressively reduced bandwidth capacity. Each architecture excursion has the same scenario timeline and measurement parameters. The results of each excursion are graphically compared and statistically analyzed to identify communication performance impacts at critical events throughout the scenario. A correlation is made with communication performance and combat effectiveness when the enemy force attrition is compared over each excursion to identify if a decrease in combat effectiveness can be seen as a result of reduced communication capability. The results show that the NSS can be used appropriately and accurately to represent communication system effectiveness within a distributed operation scenario supported by the ESG.
DTIC
Combat; Computerized Simulation; Simulation

20080030622 Naval Research Lab., Washington, DC USA
Formal Methods for Specifying, Validating, and Verifying Requirements
Heitmeyer, Constance L; May 28, 2007; 13 pp.; In English
Report No.(s): AD-A480106; XB-NRL/ITD/5500; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This paper describes the specification, validation and verification of system and software requirements using the SCR tabular method and tools. An example is presented to illustrate the SCR tabular notation, and an overview of each of the ten tools in the SCR toolset is presented.
DTIC
Computer Programming; Requirements; Software Engineering

20080030627 Carnegie-Mellon Univ., Pittsburgh, PA USA
ASSIP Study of Real-Time Safety-Critical Embedded Software-Intensive System Engineering Practices
Feiler, Peter H; Niz, Dionisio de; Feb 2008; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A480129; CMU/SEI-2008-SR-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Modern weapon systems increasingly depend on real-time, safety-critical, embedded (RTSCE) software to achieve their mission objectives. In addition, these systems are experiencing far longer service lives than anticipated at their inception. Army weapon system developers are concerned that this combination of factors renders today's software acquisition and development practices insufficient to address the challenges of these software-intensive systems. To address the concern, the Army Strategic Software Improvement Program tasked the Carnegie Mellon Software Engineering Institute (SEI) to assess RTSCE software-intensive systems issues and develop recommendations. The findings of phase one of that study are presented in this report: (1) industry is driving the development of tools for model-based engineering to meet the needs of RTSCE system development, and (2) many opportunities exist for the U.S. Department of Defense (DoD) to gain experience and advance the transition of these tools into DoD programs.
DTIC
Computer Programming; Computer Programs; Embedding; Languages; Molecular Beam Epitaxy; Procedures; Real Time Operation; Safety; Simulation; Software Engineering; Systems Engineering; Weapon Systems

20080030640 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA
Towards Collaboration with Robots in Shared Space: Spatial Perspective and Frames of Reference
Schultz, Alan C; Trafton, J G; Apr 2005; 4 pp.; In English
Report No.(s): AD-A480177; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Imagine mobile robots of the future working side by side with humans, collaborating in a shared workspace. For this to become a reality, robots must be able to do something that humans do constantly: understand how others perceive space and the relative positions of objects around them -- they need the ability to see things from another person's point of view. The authors' research group and others are building computational, cognitive, and linguistic models that can deal with frames of

reference. Issues include dealing with constantly changing frames of reference, changes in spatial perspective, understanding what actions to take, the use of new words, and common ground. Their approach is an implementation informed by cognitive and computational theories. It is based on developing computational cognitive models (CCMs) of certain high-level cognitive skills humans possess that are relevant for collaborative tasks. They then use these models as reasoning mechanisms for their robots. Why do they propose using CCMs as opposed to more traditional programming paradigms for robots? They believe that by giving the robots similar representations and reasoning mechanisms to those used by humans, they will build robots that act in a way that is more compatible with humans.
DTIC
Artificial Intelligence; Cognition; Mathematical Models; Robots; Visual Perception

20080030642 Library of Congress, Washington, DC USA
Avatars, Virtual Reality Technology, and the U.S. Military: Emerging Policy Issues
Wilson, Clay; Apr 9, 2008; 7 pp.; In English
Report No.(s): AD-A480182; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes virtual reality technology, which uses three-dimensional user- generated content, and its use by the U.S. military and intelligence community for training and other purposes. Both the military and private sector use this new technology, but terrorist groups may also be using it to train more realistically for future attacks, while still avoiding detection on the Internet. The issues for Congress to consider may include the cost-benefit implications of this technology, whether sufficient resources are available for the communications infrastructure needed to support expanded use of virtual reality technology, and whether there might be national security considerations if the USA falls behind other nations in developing or adopting this new technology. This report will be updated as events warrant.
DTIC
Policies; Virtual Reality

20080030847 Naval Postgraduate School, Monterey, CA USA
A Survey of Mobile and Wireless Technologies for Augmented Reality Systems (Preprint)
Papagiannakis, George; Singh, Gurminder; Magnenat-Thalmann, Nadia; Feb 2008; 31 pp.; In English
Report No.(s): AD-A479853; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479853

Recent advances in hardware and software for mobile computing have enabled a new breed of mobile AR systems and applications. A new breed of computing called augmented ubiquitous computing has resulted from the convergence of wearable computing, wireless networking and mobile AR interfaces. In this paper we provide a survey of different mobile and wireless technologies and how they have impact AR. Our goal is to place them into different categories so that it becomes easier to understand the state of art and to help identify new directions of research.
DTIC
Surveys; Technology Assessment

20080030886 Quantum Leap Innovations, Inc., Newark, DE USA
Targeted Information Dissemination
Kallurkar, Srikanth; Mar 2008; 50 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-05-C-0104; Proj-558E
Report No.(s): AD-A480150; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Quantum Leap Innovations (QLI) developed a Targeted Information Dissemination (TID) system for rapid gathering and dissemination of the right information to the right people at the right time. The TID user interface shows tasks of an analyst. A hierarchical view of interests learned over a period of time is shown for each task. A table displays documents filtered-in by the user agent. The filtering is based on an interest profile that the agent manages on behalf of the user. The user can view and change the degree of filtering, document relevance and the interests related to task at any time. QLI focused their system to derive an early warning system (EWS) posed by a potential pandemic influenza (PI) episode, but the technology will be broadly applicable and configurable as an EWS for any future biological incident.
DTIC
Computer Programs; Data Processing; Information Dissemination; User Requirements

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.

20080029276 NASA Johnson Space Center, Houston, TX, USA
Vulnerabilities, Influences and Interaction Paths: Failure Data for Integrated System Risk Analysis
Malin, Jane T.; Fleming, Land; [2006]; 13 pp.; In English; 2006 IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; Original contains color and black and white illustrations
Report No.(s): IEEEAC Paper 1450 Version 2; Copyright; Avail.: Other Sources

We describe graph-based analysis methods for identifying and analyzing cross-subsystem interaction risks from subsystem connectivity information. By discovering external and remote influences that would be otherwise unexpected, these methods can support better communication among subsystem designers at points of potential conflict and to support design of more dependable and diagnosable systems. These methods identify hazard causes that can impact vulnerable functions or entities if propagated across interaction paths from the hazard source to the vulnerable target. The analysis can also assess combined impacts of And-Or trees of disabling influences. The analysis can use ratings of hazards and vulnerabilities to calculate cumulative measures of the severity and importance. Identification of cross-subsystem hazard-vulnerability pairs and propagation paths across subsystems will increase coverage of hazard and risk analysis and can indicate risk control and protection strategies.
Author
Systems Integration; Systems Analysis; Risk Assessment; Systems Engineering; Computer Systems Performance

20080030398 Naval Postgraduate School, Monterey, CA USA
VoIP Quality Measurements in a Multilevel Secure (MLS) Environment
Adams, Jr, Coy M; Mar 1, 2008; 143 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479691; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479691

Voice over Internet Protocol (VoIP) is growing in popularity in the civilian and military communities due to its low cost and the management advantages it offers over traditional Public Switched Telephone Networks (PSTN) phone systems. Many military commands do not have the infrastructure or funding that is required to support the rapid expansion of multiple phone services at various locations throughout the world. VoIP offers a rapidly deployable alternative. A subjective study was designed to test the quality of Voice over Internet Protocol (VoIP) signals in a controlled and isolated multilevel secure network to which single level networks were attached. The experiment provided useful insights regarding VoIP testing with human subjects and its procedures can be repeated as the Monterey Security Architecture (MYSEA) project moves forward with the implementation and deployment of VoIP services in its multilevel testbed.
DTIC
Internets; Microwave Landing Systems; Protocol (Computers); Quality; Voice Communication

20080030409 Carnegie-Mellon Univ., Pittsburgh, PA USA
Incident Management Mission Diagnostic Method, Version 1.0
Dorofee, Audrey; Killcrece, Georgia; Ruefle, Robin; Zajicek, Mark; Mar 2008; 172 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A479731; CMU/SEI-2008-TR-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479731

The Incident Management Mission Diagnostic (IMMD) is a risk-based approach for determining the potential for success of an organization's incident management capability (IMC). This potential for success is based on a finite set of current conditions -- a limited set of key drivers used to estimate the current IMC health relative to a defined benchmark. Decision makers can then determine if the current state of the IMC is acceptable, or if actions are required to improve the situation. The IMMD can be viewed as an efficient, first-pass screening of an IMC to diagnose any unusual circumstances that might affect its potential for success. This document can be read for understanding of the concepts and activities of this method, or

to learn how to perform the IMMD. The method description includes full descriptions of all activities as well as a set of worksheets and instructions for executing the method.
DTIC
Computer Information Security; Computer Networks; Management Methods; Management Planning; Risk

20080030431 Army Tank-Automotive Research and Development Command, Warren, MI USA
FALCON Pilot: Applying Open Standards for PLM Systems Interoperability
Iyer, Raj; Sep 26, 2007; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479801; TARDEC-17642; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479801

This briefing discusses FALCON (Federated Army Lifecycle Collaborative Enterprise), a data exchange protocol that allows contractors access to Army vehicular product data from a range of engineering and logistics databases. Through FALCON, TARDEC can have access to a richer data set from original equipment manufacturers (OEMs). FALCON enables a route for improved data synchronization. FALCON enables use of simple add-on services via web-services. It provides a starting point for tracking configuration of individual vehicles.
DTIC
Data Transmission; Interoperability

20080030471 Naval Postgraduate School, Monterey, CA USA
Proof of Concept Integration of a Single-Level Service-Oriented Architecture into a Multi-Domain Secure Environment
Gilkey, Craig M; Mar 2008; 158 pp.; In English
Report No.(s): AD-A479878; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479878

Service-Oriented Architecture (SOA) software has revolutionized data interchange in the business world. A SOA software platform integrates independent, unrelated applications into a common architecture, thereby introducing data reuse, interoperability, and loose coupling between the services involved. The U.S. Navy is currently experimenting with a SOA-based research portal called TACFIRE, or Tactical Applications for Collaboration in FIRE (FORCEnet Innovation and Research Enterprise). TACFIRE provides a set of lightweight, XML-based web services derived from the Oracle Collaboration Suite (OCS) 10g SOA. Such web services operating across multiple security domains would provide additional advantages, including improved intelligence aggregation, and real-time collaboration between users in different security domains. However, current TACFIRE implementations provide no multi-domain functionality between different classification levels. To date, the incorporation of a SOA software suite into a multilevel secure environment has neither been designed nor implemented. This project has explored how a SOA software suite could be integrated into a multilevel environment. The OCS 10g has been configured to run within the Monterey Security Architecture (MYSEA) multilevel testbed. This thesis addresses DoD requirements for building enterprise-level computing architecture capable of providing a full range of information services at all major security classifications and information handling caveats.
DTIC
Service Oriented Architecture

20080030472 Naval Postgraduate School, Monterey, CA USA
Software Reuse in the Naval Open Architecture
Greathouse, Carlus A; Mar 2008; 95 pp.; In English
Report No.(s): AD-A479879; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479879

This thesis describes a web-based continuous learning module (CLM) for use in introducing members of the Department of the Navy s acquisition community to software reuse in the context of Naval Open Architecture. The CLM introduces the student to principles for effective software reuse, explains the unique challenges of software reuse, discusses software reuse within the context of the Naval Open Architecture under the current Department of Defense and DoN policy and guidance, provides a strategy for successful software reuse, and introduces the student to the Software Hardware Asset Reuse Enterprise (SHARE) repository established by the Navy s Open Architecture (OA) program.
DTIC
Dynamic Structural Analysis; Marine Technology; Software Reuse

20080030486 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Hot Swapping Protocol Implementations in the OPNET Modeler Development Environment

Coyne, Mark E; Mar 2008; 107 pp.; In English

Contract(s)/Grant(s): Proj-ENG-08-175

Report No.(s): AD-A479919; AFIT/GCS/ENG/08-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479919

This research report demonstrates hot swapping protocol implementations in OPNET via the building of a dependency injection testing framework. The thesis demonstrates the externalization (compiling as stand-alone code) of OPNET process models, and their inclusion into custom DLL's (Dynamically Linked Libraries). A framework then utilizes these process model DLL's, to specify, or 'inject' process implementations post-compile time into an OPNET simulation. Two separate applications demonstrate this mechanism. The first application is a toolkit that allows for the testing of multiple routing related protocols in various combinations without code re-compilation or scenario re-generation. The toolkit produced similar results as the same simulation generated manually with OPNET. The second application demonstrates the viability of a unit testing mechanism for the externalized process models. The unit testing mechanism was demonstrated by integrating with CxxTest and executing xUnit style test suits.

DTIC

Computer Networks; Plugs; Protocol (Computers)

20080030634 Army War Coll., Carlisle Barracks, PA USA

Facing the Challenge: Implementing the Defense Integrated Military Human Resources System

Herrera, Edward G; Mar 18, 2008; 31 pp.; In English

Report No.(s): AD-A480151; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Is the Defense Integrated Military Human Resources System (DIMHRS) the answer to the long standing personnel and pay problems in the U.S. military? This project will examine the reasons behind the Department of Defense's (DOD) decision to develop the first integrated, all service, all component personnel/pay system followed by an assessment of the value added along with potential problem areas and limitations associated with this monumental undertaking. Scheduled for implementation on 1 October 2008, the question remains, 'Is the development and implementation of this system the correct course of action?'

DTIC

Human Resources; Information Systems; Military Personnel; Personnel Management; Systems Integration

20080030650 Advantech, Inc., Annapolis, MD USA

ARN Integrated Retail Module (IRM) System at Ft. Bliss - Central Issue Facility (CIF) Local Tariff

Mar 14, 2008; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): SP0103-02-D-0018

Report No.(s): AD-A480206; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Final Technical Report (FTR) covers project work accomplished for the Apparel Research Network (ARN)/Customer Driven Uniform Manufacture (CDUM) project of the Defense Logistics Agency (DLA). The overall project activities for this STP included implementation of all network infrastructure components of the ARN Virtual Item Manager-Integrated Retail Module (VIM-IRM) at Fort Bliss including the ARN Local Area Network (LAN) and Radio Frequency (RF) wireless communication ARN Server and associated workstations High Speed Internet communications Issue Scan Forms electronic document storage and hand held wireless (RF) terminals. In addition project activities included implementing the Issue Scan Forms and electronic document storage as Phase 1 of ARN VIM-IRM at the Central Issue Facility (CIF). The implementation of VIM-IRM was initially a research effort to demonstrate the capability to establish an environment where VIM-IRM was integrated through the ARN-LAN to provide simultaneous automated support to a Central Issue Facility for issue to deploying soldiers a Central Initial Issue Point (CIIP) for issue to recruits and a 3D Whole Body Scanner for obtaining body measurements of soldiers and translation of the same into sizing information for issue of clothing items and for building a local tariff.

DTIC

Clothing; Communication Networks; Information Systems; Local Area Networks; Systems Integration

20080030844 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Cyber Flag: A Realistic Cyberspace Training Construct
Hansen, Andrew P; Mar 27, 2008; 134 pp.; In English
Contract(s)/Grant(s): Proj-ENR-07-122
Report No.(s): AD-A479931; AFIT/GCS/ENG/08-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479931

As is well understood, the rapidly unfolding challenges of cyberspace is a fundamental warfare paradigm shift revolutionizing the way future wars will be fought and won. A significant test for the Air Force (indeed any organization with a credible presence in cyberspace) will be providing a realistic training environment that fully meets this challenge. Why create another Flag level exercise? Realistic training (that which is effective, comprehensive and coordinated) is crucial to success in time of war. Red Flag provides dominant training within the air domain and now with the evolution of cyberspace, a comprehensive training environment is necessary to meet this growing and broadening threat. This Thesis builds on the Red Flag tactical training exercise in order to define a future environment that combines the air, space and cyberspace domains with specific emphasis on cyberspace capabilities and threats. Red Flag has and continues to be a great tactical training exercise; Cyber Flag would use the best practices of Red Flag (and other realistic training venues) to define a future training environment for the cyberspace domain. There is no better training than the hands-on realism associated with participation in an exercise such as Red Flag. Secretary Michael W. Wynne has a vision for dominant operations in cyberspace 'comparable to the Air Force's global, strategic omnipresence in air and space.' This bold vision requires a combination of joint coordination, skilled forces and a realistic training environment to bring them all together; Cyber Flag is the suggested vehicle for accomplishing this.
DTIC
Education; Electronic Warfare; Internets; War Games

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*.

20080026343 NASA Johnson Space Center, Houston, TX, USA
Towards Supervising Remote Dexterous Robots Across Time Delay
Hambuchen, Kimberly; Bluethmann, William; Goza, Michael; Ambrose, Robert; Wheeler, Kevin; Rabe, Ken; May 15, 2006; 6 pp.; In English; ICRA06, 15-19 May 2006, Orlando, FL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080026343

The President s Vision for Space Exploration, laid out in 2004, relies heavily upon robotic exploration of the lunar surface in early phases of the program. Prior to the arrival of astronauts on the lunar surface, these robots will be required to be controlled across space and time, posing a considerable challenge for traditional telepresence techniques. Because time delays will be measured in seconds, not minutes as is the case for Mars Exploration, uploading the plan for a day seems excessive. An approach for controlling dexterous robots under intermediate time delay is presented, in which software running within a ground control cockpit predicts the intention of an immersed robot supervisor, then the remote robot autonomously executes the supervisor s intended tasks. Initial results are presented.
Author
Robotics; Time Lag; Man Machine Systems; Space Exploration; Ground Based Control; Robots

20080030434 Army Tank-Automotive Research and Development Command, Warren, MI USA
The Joint Center for Robotics and Its JAUS Implementation Efforts
Theisen, Bernard; Apr 16, 2008; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479810; TARDEC-18829-RC; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479810

The mission of the Joint Center for Robotics is to serve as a focal point for military ground vehicle robotics integration

efforts and to coordinate support across the life cycle spectrum (research, development, acquisition and sustainment) for all current and future military unmanned ground vehicles and robotic platforms.
DTIC
Robotics; Universities

20080030453 Army Tank-Automotive Research and Development Command, Warren, MI USA
Proposed FY09 ATO-D: Improved Mobility and Operational Performance through Autonomous Technologies (IMOPAT)
Koshko, Jeff; Apr 9, 2008; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479838; TARDEC-18807; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479838

Enable indirect vision (IV) based Soldier-systems (manned/unmanned/Soldier) to move quickly and safely while maintaining 360 local situational awareness (LSA) to enhance operational performance.
DTIC
Autonomy; Mobility; Systems Engineering

20080030494 Naval Postgraduate School, Monterey, CA USA
Wireless Robotic Communications in Urban Environments: Issues for the Fire Service
Hough, George; Mar 2008; 169 pp.; In English
Report No.(s): AD-A479946; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479946

Firefighters are tasked with conducting search and rescue operations at incidents ranging from minor smoke conditions to multi-agency disasters. In each instance, a rapid risk assessment must be conducted based on preliminary dispatch information. Small lightweight man portable robots are a natural fit for gaining improved situational awareness, yet few have been employed for this application. The problems encountered in using wireless robots in urban environments are among the primary reasons. This thesis focuses on the wireless link between the robot and the firefighter employing it. The work presented is useful for policy makers in allocating public safety spectrum, firefighters in pre-planning responses, and engineers for designing relevant control systems. While the arguments rest on a technical footing of test data and models, the paper is written primarily for a non-technical audience. A technology acceptance model is developed for employing robots wirelessly. Test data is presented showing the debilitating effects of interference from employing multiple robots concurrently. Models are applied to predict signal loss in tunnels and urban environments, and results indicate an optimal frequency range exists between 500 MHz and 1 GHz. A case is presented to allocate spectrum in this range using a priority access protocol.
DTIC
Fire Fighting; Fires; Robotics; Safety; Telecommunication; Wireless Communication

20080030603 Naval Research Lab., Washington, DC USA
Using Simulations to Model Shared Mental Models
Kennedy, William G; Trafton, J G; Jul 2007; 3 pp.; In English
Report No.(s): AD-A480040; XB-NRL/MR/5510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Good team members seem to have the ability to simulate what others on the team will do in different situations. Team researchers have long studied what makes an effective team. Their methodology has been to examine how high and low performing teams accomplish team-related tasks. They have suggested that a good team-member has three knowledge components (Cannon-Bowers, Salas, & Converse, 1993): (1) Knowledge of own capabilities [meta-knowledge], (2) Knowledge of the task, and (3) Knowledge about the capabilities of their teammates. Most researchers have suggested that these three components are deeply inter-related; without any one of these, a person is not a good team member. However, without a computational theory, these claims can be difficult to examine empirically. The focus of this paper is the third component, the cognitive modeling done of a teammate's cognitive processes. This shared understanding of teammates frequently called a shared mental model (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). We start with the premise that humans use themselves as an initial model of their teammate, and then refine it as the team (and individuals within the team) gains experience. Our primary research goal is to create a computational theory of teamwork by modeling the individuals within the team so that we can eventually build plausible robots for teamwork and human-robot interaction.
DTIC
Cognition; Computerized Simulation; Robots; Simulation

20080030610 Naval Research Lab., Washington, DC USA

Integrating Vision and Audition within a Cognitive Architecture to Track Conversations

Trafton, J G; Bugajska, Magdalena D; Fransen, Benjamin R; Ratwani, Raj M; Mar 2008; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480061; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe a computational cognitive architecture for robots which we call ACT-R/E (ACT-R/Embodied). ACT-R/E is based on ACT-R, but uses different visual, auditory and movement modules. We describe a model that uses ACT-R/E to integrate visual and auditory information to perform conversation tracking in a dynamic environment. We also performed an empirical evaluation study which shows that people see our conversational tracking system as extremely natural.

DTIC

Auditory Perception; Cognition; Conversation; Visual Perception

20080030884 George Mason Univ., Fairfax, VA USA

An Integrated Self-Aware Cognitive Architecture

DeJong, Kenneth A; Samsonovich, Alexei V; Ascoli, Giorgio A; Mar 2008; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-2-0278; Proj-BICA

Report No.(s): AD-A480166; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The result of our BICA Phase I research effort is the specification of a computational cognitive architecture that is capable of human-like cognition, learning and social behavior in a wide range of real-world situations and paradigms set in virtual environments. Our architecture focuses on the higher-level cognitive processes involved in human cognition and is designed to be integrated into a larger end-to-end architecture that includes lower level sensing and action. The main feature of our architecture is the notion of self aware cognition that we believe is necessary for human-like cognitive growth. Our approach is inspired by studies of the human brain-mind: in particular, by theoretical models of representations of agency in the higher associative human brain areas. This feature (a theory of mind including representations of one's self) allows the system to maintain human-like attention, focus on the most relevant features and aspects of a situation, and come up with ideas and initiatives that may not follow from formal logic. The result is a robust cognitive system capable of significant cognitive growth.

DTIC

Cognition; Machine Learning

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20080030105 NASA Langley Research Center, Hampton, VA, USA

Signal Analysis Algorithms for Optimized Fitting of Nonresonant Laser Induced Thermal Acoustics Damped Sinusoids

Balla, R. Jeffrey; Miller, Corey A.; July 2008; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 599489.02.07.07.03.03.01

Report No.(s): NASA/TM-2008-215327; L-19491; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030105

This study seeks a numerical algorithm which optimizes frequency precision for the damped sinusoids generated by the nonresonant LITA technique. It compares computed frequencies, frequency errors, and fit errors obtained using five primary signal analysis methods. Using variations on different algorithms within each primary method, results from 73 fits are presented. Best results are obtained using an AutoRegressive method. Compared to previous results using Prony s method, single shot waveform frequencies are reduced approx.0.4% and frequency errors are reduced by a factor of approx.20 at 303K to approx. 0.1%. We explore the advantages of high waveform sample rates and potential for measurements in low density gases.

Author

Signal Analysis; Sine Waves; Frequencies; Errors; Acoustics

20080030406 Naval Academy, Annapolis, MD USA

Cautious Inference in Collective Classification

McDowell, Luke K; Gupta, Kalyan M; Aha, David W; Jan 2007; 7 pp.; In English

Report No.(s): AD-A479720; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479720

Collective classification can significantly improve accuracy by exploiting relationships among instances. Although several collective inference procedures have been reported they have not been thoroughly evaluated for their commonalities and differences. We introduce novel generalizations of three existing algorithms that allow such algorithmic and empirical comparisons. Our generalizations permit us to examine how cautiously or aggressively each algorithm exploits intermediate relational data, which can be noisy. We conjecture that cautious approaches that identify and preferentially exploit the more reliable intermediate data should outperform aggressive approaches. We explain why caution is useful and introduce three parameters to control the degree of caution. An empirical evaluation of collective classification algorithms, using two base classifiers on three data sets, supports our conjecture.

DTIC

Algorithms; Classifications; Inference

20080030450 Army Tank-Automotive Research and Development Command, Warren, MI USA

Development of a Vehicle Model/Simulation Evaluation Tool

Howe, J G; Chrstos, Jeffrey P; Romano, Richard; O'Kins, James; Nov 8, 2007; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479835; RDECOM/TARDEC-TR-18434; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479835

As part of the evaluation of vehicle simulation models, a vehicle dynamics engineer typically desires to compare simulation results to test data from actual vehicles and/or results from known, or higher fidelity simulations. Depending on the type of model, several types of tests and/or maneuvers may need to be compared. For military vehicles, there is the additional requirement to run specific types of maneuvers for vehicle model evaluations to ensure that the vehicle complies with procurement requirements. A thorough evaluation will run two different categories of tests/maneuvers. The first category consists of laboratory type tests that include weight distribution, kinematics and compliance, steering ratio, and other static measures. The second category consists of dynamic maneuvers that include handling, drive train, braking, ride, and obstacle types. In this paper, a process for proper evaluation of vehicle simulation models is presented. A method for evaluating simulation results from different simulation programs is also presented.

DTIC

Models; Simulation

20080030665 Naval Postgraduate School, Monterey, CA USA

Microstructure Signature of Equilibrium Double-Diffusive Convection

Caplan, Shelley D; Mar 2008; 75 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480340; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Salt fingering is an oceanographic small-scale phenomenon that occurs in statically stable regions where relatively warm salty water lies above cold, fresh water. Currently, analyses and interpretation of most microstructure measurements and salt fingers in particular, are based upon the fundamental assumption that the microstructure is isotropic. While is it generally accepted that the isotropic assumption may lead to underestimates of the dissipation rates of thermal and velocity fluctuations by factors of two to four, no significant attempt has been made to take the anisotropy of microstructure into account yet. Thus, the anisotropy remains one of the key elements of uncertainty in the microstructure analysis and a major obstacle in quantifying the strength of vertical mixing in the ocean. This thesis represents an attempt to use direct numerical simulation in two and three-dimensions, in order to examine the validity of the isotropic assumption for the fully developed double-diffusive convection over a range of density ratios. Calculations are performed and the aspect ratio of the salt fingers is shown to be considerably different from unity. The anisotropy is particularly evident at higher density ratios. Based on the performed simulations, we formulate a simple method to take the anisotropy into account. The proposed technique is readily applicable to the oceanic data from free-falling and towed profilers. We expect that the reanalysis of microstructure with high density ratios would yield considerably different estimates of the diapycnal diffusivities and fluxes of heat and salt. With regard

to Navy interests, it should be noted that double diffusion can exert a substantial influence on the propagation and dispersion of the acoustic signature particularly in the regions of the pronounced thermocline staircases.
DTIC
Convection; Diffusion; Diffusivity; Fingers; Microstructure; Numerical Analysis; Oceanography; Salinity; Signatures; Underwater Acoustics

20080030668 Stanford Univ., Stanford, CA USA
On Boundary Condition Capturing for Multiphase Interfaces
Hong, Jeong-Mo; Shinar, Tamar; Kang, Myungjoo; Fedkiw, Ronald; Mar 31, 2006; 26 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0620; N00014-06-1-0393
Report No.(s): AD-A480349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper begins with an overview of the boundary condition capturing approach to solving problems with interfaces. Although, the authors' original motivation was to extend the ghost fluid method from compressible to incompressible flow, the elliptic nature of incompressible flow quickly quenched the idea that ghost cells could be defined and used in the usual manner. Instead the boundary conditions had to be implicitly captured by the matrix formulation itself, leading to the novel approach. We first review the work on the variable coefficient Poisson equation, noting that the simplicity of the method allowed for an elegant convergence proof. Simplicity and robustness also allowed for a quick extension to three-dimensional two-phase incompressible flows including the effects of viscosity and surface tension, which is discussed subsequently. The method has enjoyed popularity in both computational physics and computer graphics, and we show some comparisons with the traditional delta function approach for the visual simulation of bubbles. Finally, we discuss extensions to problems where the velocity is discontinuous as well, as is the case for premixed flames, and show an example of multiple interacting liquids that includes all of the aforementioned phenomena.
DTIC
Boundary Conditions; Multiphase Flow

20080030850 Applied Research Associates, Inc., Tyndall AFB, FL USA
A Neural Network Approach to Modeling the Effects of Barrier Walls on Blast Wave Propagation PREPRINT
Flood, Ian; Bewick, Bryan T; Salim, Hani A; Dinan, Robert J; Mar 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915
Report No.(s): AD-A479776; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479776

A practical means of reducing the impact of blast loads on buildings is to introduce a barrier wall between the explosive device and the building. The height and location of the barrier wall are key design variables in terms of effectively reducing the peak positive and negative overpressure and impulse on the building. Until recently, set-ups that included a barrier between the explosive device and the building could only be modeled with consistent accuracy by using numeric simulation techniques. Unfortunately, these models require many hours of processing time to complete a simulation run, even for the fastest of today's computers. This has led several researchers to consider the use of advanced empirical modeling methods, specifically artificial neural networks, to overcome problems of computationally expensive simulations. Neural networks have the potential to make predictions of the influence of a barrier on blast propagation in a matter of seconds using a desktop computer, thus making it easier for designers to home-in on an optimal solution. Artificial neural networks appear to be well suited to this application, performing well for problems that are strongly non-linear and comprise many independent variables. This paper reports on past and on-going research in this field at AFRL Tyndall, using both scaled-live experimental data and simulated data to develop the neural models. The design and validation of these models are presented, and their successes and deficiencies are discussed. The paper concludes with an overview of current and future research plans to take this work to a state suitable for use in the field, and to extend it to problems comprising significantly more complicated configurations of structures than a barrier positioned between the explosive device and a building.
DTIC
Blast Loads; Detonation Waves; Mathematical Models; Neural Nets; Shock Waves; Walls; Wave Propagation

20080030883 Army Research Lab., Adelphi, MD USA
Image Resolution Computation for Ultra-Wideband (UWB) Synchronous Impulse Reconstruction (SIRE) Radar
Nguyen, Lam; Sep 2007; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480190; ARL-TN-294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the approach used to compute the down-range and cross-range resolution for the U.S. Army

Research Laboratory synchronous impulse reconstruction (SIRE) radar. The results determine the upper bound in term of resolution that the radar can achieve (for targets along the center line of the physical receiving antenna array). These results are needed for the computation of the calibration factor for this radar.
DTIC
Broadband; Computation; Detection; Image Resolution; Impulses; Synthetic Aperture Radar; Target Acquisition

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080026337 NASA Johnson Space Center, Houston, TX, USA
The FLUKA Code: An Overview
Ballarini, F.; Battistoni, G.; Campanella, M.; Carboni, M.; Cerutti, F.; Empl, A.; Fasso, A.; Ferrari, A.; Gadioli, E.; Garzelli, M. V.; Lantz, M.; Liotta, M.; Mairani, A.; Mostacci, A.; Muraro, S.; Ottolenghi, A.; Pelliccioni, M.; Pinsky, L.; Ranft, J.; Roesler, S.; Sala, P. R.; Scannicchio, D.; Trovati, S.; Villari, R.; Wilson, T.; September 05, 2006; 10 pp.; In English; 19th Divisional Nuclear Physics Conference, 5-9 Sep. 2005, Pavia, Italy; Original contains color and black and white illustrations
Contract(s)/Grant(s): DE-AC03-76SF00515; NAG2-81901; 101-60-15; Copyright; Avail.: CASI: A02, Hardcopy

FLUKA is a multipurpose Monte Carlo code which can transport a variety of particles over a wide energy range in complex geometries. The code is a joint project of INFN and CERN: part of its development is also supported by the University of Houston and NASA. FLUKA is successfully applied in several fields, including but not only, particle physics, cosmic ray physics, dosimetry, radioprotection, hadron therapy, space radiation, accelerator design and neutronics. The code is the standard tool used at CERN for dosimetry, radioprotection and beam-machine interaction studies. Here we give a glimpse into the code physics models with a particular emphasis to the hadronic and nuclear sector.
Author
Monte Carlo Method; Nuclear Physics; Hadrons; Molecular Dynamics; Quantum Mechanics

20080030381 Battelle Memorial Inst., Columbus, OH USA
Background and Target Randomization Root Mean Square (RMS) Background Matching Using a New Delta T Metric Definition
Choe, Howard C; Meitzler, Thomas; Gerhart, Grant; May 17, 1993; 15 pp.; In English
Contract(s)/Grant(s): DAAL03-91-C-0034
Report No.(s): AD-A479624; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479624

EO/IR/Laser detection of a target amidst clutter/background is a difficult problem often treated with simplistic models. Unlike noise, clutter is more complex, neither spectrally white nor statistically Gaussian. Therefore, it is insufficient to lump clutter with noise and use standard detection curves. Using current target detection models, it is extremely difficult to perform effectiveness assessments of signature management technologies for survivability of military ground vehicles. Current models do not consider the vehicle on a component-level basis and do not account for artifacts introduced into images from aliasing and varying amounts of clutter. Algorithms must be developed that quantify the effects of random backgrounds on the imaging capability of electrooptical systems to improve false alarm rates. Current trends dictate that EO/IR/Laser imaging systems must consider developments in signature management technologies and countermeasures that are driving clutter magnitudes higher than target signature magnitudes. These trends make the problem of target detection in clutter especially critical. Battelle has produced image randomization software called BATRAN (Background and Target Randomization) which computes various types of statistical distributions to randomize background and target pixels separately. The types of statistics implemented include exponential, Gaussian, log-normal, and Rice distributions for both the background and target. To generate synthetic images to assess the detection performance of thermal imaging systems and countermeasured platform signatures, a method to characterize the background and target is required so that their signatures can be statistically matched. Current methods use an area weighted average temperature difference (AWAA7), which is regarded as inadequate in representing observer's sensitivity to the inherent detection cues of the target/background/clutter signatures.
DTIC
Background Noise; Clutter; Mean Square Values; Signatures; Targets

20080030385 Purdue Univ., West Lafayette, IN USA

Functional Bregman Divergence and Bayesian Estimation of Distributions (Preprint)

Frigyik, B A; Srivastava, S; Gupta, M R; Jan 2008; 11 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0843

Report No.(s): AD-A479637; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479637

A class of distortions termed functional Bregman divergences is defined, which includes squared error and relative entropy. A functional Bregman divergence acts on functions or distributions, and generalizes the standard Bregman divergence for vectors and a previous pointwise Bregman divergence that was defined for functions. A recently published result showed that the mean minimizes the expected Bregman divergence. The new functional definition enables the extension of this result to the continuous case to show that the mean minimizes the expected functional Bregman divergence over a set of functions or distributions. It is shown how this theorem applies to the Bayesian estimation of distributions. Estimation of the uniform distribution from independent and identically drawn samples is used as a case study. We have defined a general Bregman divergence for functions and distributions that can provide a foundation for results in statistics, information theory and signal processing.

DTIC

Bayes Theorem; Divergence; Statistical Distributions

20080030402 Naval Postgraduate School, Monterey, CA USA

Power Law Decay in Model Predictability Skill

Chu, Peter C; Ivanov, Leonid M; Kantha, Lakshmi H; Melnichenko, Oleg V; Poberezhny, Yuri A; Jan 2002; 6 pp.; In English

Report No.(s): AD-A479712; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479712

Ocean predictability skill is investigated using a Gulf of Mexico nowcast/forecast model. Power law scaling is found in the mean square error of displacement between drifting buoy and model trajectories (both at 50 m depth). The probability density function of the model valid prediction period (VPP) is asymmetric with a long and broad tail on the higher value side, which suggests long-term predictability. The calculations demonstrate that the long-term (extreme long, such as 50-60 day) predictability is not an 'outlier' and shares the same statistical properties as the short-term predictions.

DTIC

Errors; Forecasting; Gulf of Mexico; Marine Environments; Ocean Currents; Ocean Models; Predictions

20080030424 Carnegie-Mellon Univ., Pittsburgh, PA USA

Using the Vickrey-Clarke-Groves Auction Mechanisms for Enhanced Bandwidth Allocation in Tactical Data Networks

Klein, Mark; Plakosh, Daniel; Walnau, Kurt; Jan 2008; 59 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A479781; CMU/SEI-2008-TR-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479781

A mechanism is an institution such as an auction, voting protocol, or a market that defines the rules for how humans are allowed to interact, and governs the procedure for how collective decisions are made. Computational mechanisms arise where computational agents work on behalf of humans. This report describes an investigation of the potential for using computational mechanisms to improve the quality of a combat group s common operating picture, in a setting where network bandwidth is scarce. Technical details are provided about a robust emulation of a tactical data network (based loosely on the Navy LINK-11) that was developed for the study. The report also outlines the basic principles of mechanism design, as well as the features of the Vickrey-Clarke-Groves (VCG) auction mechanism implemented for the study. The report describes how the VCG mechanism was used to allocate network bandwidth for sensor data fusion. Empirical results of the investigation are presented, and ideas for further exploration are offered. The overall conclusion of the study is that computational mechanism design is a promising alternative to traditional systems approaches to resource allocation in systems that are highly dynamic, involve many actors engaged in varying activities, and have varying and possibly competing goals.

DTIC

Allocations; Bandwidth; Communication Networks; Multisensor Fusion

20080030439 Naval Postgraduate School, Monterey, CA USA
Effect of Navy Individual Augmentee Deployment/s on Mental Health Outcomes
Andres, Joey M; Mar 2008; 102 pp.; In English
Report No.(s): AD-A479820; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479820

Since the start of the Global War on Terror, the Navy has provided individual augmentee (IA) sailors to support contingency operations in order for other Services to effectively perform their missions. This study analyzes the effects of IA deployments on the mental health outcome among Navy sailors. Data for this study came from three different sources: PERS-4G3 (Active Duty Augmentation Branch), Army Medical Surveillance Activity, and Defense Manpower Data Center. A multivariate analysis using probit models was used to estimate the effects. Analyses on the officer and enlisted models indicate that an IA deployment by itself does not appear to adversely affect mental and physiological health outcomes. However, an IA officer deployed to a hostile location substantially increases the probability of requiring a mental health referral compared to a non-IA officer who is also deployed to a hostile region. In contrast, an enlisted service member on an IA tour to a hostile location has a lower probability of an adverse mental and physiological health outcome compared to a non-IA enlisted service member who is also assigned to a hostile region. Due to the long period of manifestation of mental health problems, future study should follow up with those soldiers one year after the deployment.
DTIC
Deployment; Mental Health; Military Personnel; Multivariate Statistical Analysis; Navy; Psychological Tests

20080030497 Washington Univ., Seattle, WA USA
Adaptive Local Linear Regression with Application to Printer Color Management
Gupta, Maya R; Garcia, Eric K; Chin, Erika; Jan 2008; 25 pp.; In English
Report No.(s): AD-A480004; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA480004

Local learning methods, such as local linear regression and nearest neighbor classifiers, base estimates on nearby training samples, neighbors. Usually the number of neighbors used in estimation is fixed to be a global 'optimal' value, chosen by cross-validation. This paper proposes adapting the number of neighbors used for estimation to the local geometry of the data, without need for cross-validation. The term enclosing neighborhood is introduced to describe a set of neighbors whose convex hull contains the test point when possible. It is proven that enclosing neighborhoods yield bounded estimation variance under some assumptions. Three such enclosing neighborhood definitions are presented: natural neighbors, natural neighbors inclusive, and enclosing kappa-NN. The effectiveness of these neighborhood definitions with local linear regression is tested for estimating look-up tables for color management. Significant improvements in error metrics are shown, indicating that enclosing neighborhoods may be a promising adaptive neighborhood definition for other local learning tasks as well, depending on the density of training samples.
DTIC
Color; Printers; Printing; Regression Analysis

20080030601 Naval Postgraduate School, Monterey, CA USA
Communicating Optimized Decision Input from Stochastic Turbulence Forecasts
Szczes, Jeanne R; Mar 2008; 159 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480037; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The uncertainty of weather forecasts contributes to mission risk. Ensemble data can improve combat capability by incorporating forecast uncertainty into the warfighter decision process. The study transforms raw ensemble data into optimized decision inputs for upper level turbulence using ORM principles and decision science. It demonstrates the methodology and importance of incorporating ambiguity, the uncertainty in forecast uncertainty, into the decision making process using the Taijitu method to estimate ambiguity. Comparing ambiguity and risk tolerance uncertainty intervals produces a more appropriate decision input compared to currently existing methods. Significant differences between the current and research derived decision input products demonstrate potential value added to decision making by incorporating ambiguity information. An effective visualization is devised for varying levels of risk tolerance and mission thresholds that is educational and practical for users. Research procedures and results can serve as an example to further education and development of stochastic methods in the Air Force and Department of Defense.
DTIC
Combat; Communicating; Decision Making; Estimates; Forecasting; Stochastic Processes; Turbulence

20080030625 Army Research Lab., Adelphi, MD USA

Statistical Methods for Analysis of Hyperspectral Anomaly Detectors

Rosario, Dalton; Sep 2007; 96 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480123; ARL-TR-4266; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Most hyperspectral (HS) anomaly detectors in the literature have been evaluated using a few HS imagery sets to estimate the well-known ROC curve. Although this evaluation approach can be helpful in assessing detectors rates of correct detection and false alarm on a limited dataset, it does not shed lights on reasons for these detectors strengths and weaknesses using a significantly larger sample size. This paper discusses a more rigorous approach to testing and comparing HS anomaly detectors, and it is intended to serve as a guide for such a task. Using randomly generated samples, the approach introduces hypothesis tests for two different kinds of data: (i) idealized homogeneous samples and (ii) idealized heterogeneous samples, where model parameters can vary the difficulty level of these tests. In (i), a simulation experiment is devised to address a more generalized concern the expected degradation of correct detection as a function of increasing noise on a given alternative hypothesis. In (ii), fundamental features of a spectral sample (magnitude and shape) are modeled separately so that strengths and weaknesses of competing detectors can be independently assessed for each feature. Additionally, detectors ability to suppress transition of regions in the imagery is assessed in (ii).

DTIC

Anomalies; Degradation; Detectors; Probability Density Functions; Statistical Analysis

20080030639 Washington Univ., Seattle, WA USA

Minimum Expected Risk Estimation for Near-neighbor Classification

Gupta, Maya R; Srivastava, Santosh; Cazzanti, Luca; Apr 2006; 21 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0843

Report No.(s): AD-A480172; UWEETR-2006-0006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We consider the problems of class probability estimation and classification when using near-neighbor classifiers, such as k-nearest neighbors (kNN). This paper investigates minimum expected risk estimates for neighborhood learning methods. We give analytic solutions for the minimum expected risk estimate for weighted kNN classifiers with different prior information, for a broad class of risk functions. Theory and simulations show how significant the difference is compared to the standard maximum likelihood weighted kNN estimates. Comparisons are made with uniform weights, symmetric weights (tricube kernel), and asymmetric weights (LIME kernel). Also, it is shown that if the uncertainty in the class probability is modeled by a random variable, and the expected misclassification cost is minimized, the result is equivalent to using a classifier with a minimum expected risk estimate. For symmetric costs and uniform priors, it is seen that minimum expected risk estimates have no advantage over the standard maximum likelihood estimates. For asymmetric costs, simulations show that the differences can be striking.

DTIC

Classifications; Risk

20080030846 Universal Technology Corp., Dayton, OH USA

Random Heterogeneity Scales and Probabilistic Description of the Long-Lifetime Regime of Fatigue (Preprint)

Jha, S K; Larsen, James M; Jun 2007; 14 pp.; In English

Contract(s)/Grant(s): F33615-03-D-5801; Proj-4349

Report No.(s): AD-A479901; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479901

The long-lifetime fatigue regime is suggested to be a probabilistic realization of sequentially occurring mechanisms. We associate these mechanisms with the development of a ranking of heterogeneity scales in the material, with decreasing probability of occurrence in the order of increasing scale, at any given loading condition. The underlying drivers for these heterogeneity levels are an array of randomly occurring microstructural configurations. With respect to the alpha-beta titanium alloy, Ti-6Al-2Sn-4Zr-6Mo (Ti-6-2-4-6), we identify four microstructural configurations producing different degrees of heterogeneous behavior. At lower stress levels, these configurations present probabilities of failure by a crack-growth-controlled, life-limiting mechanism, and a group of long-lifetime mechanisms. This description of the long-lifetime regime seems to explain the increased incidence of subsurface failures with decreasing stress level, as well as the microstructural neighborhoods involving crack initiation in short and long-lifetime mechanisms and those related to surface and subsurface failures.

DTIC

Heterogeneity; Probability Theory

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080030407 Naval Academy, Annapolis, MD USA
Case-Based Collective Classification
McDowell, Luke K; Gupta, Kalyan M; Aha, David W; May 2007; 7 pp.; In English
Report No.(s): AD-A479723; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479723

This is the first paper on textual case-based reasoning to employ collective classification, a methodology for simultaneously classifying related cases that has consistently attained higher accuracies than standard classification approaches when cases are related. Thus far, case-based classifiers have not been examined for their use in collective classification. We introduce Case-Based Collective Classification 'CBCC' and report that it outperforms a traditional case-based classifier on three tasks. We also address issues of case representation and feature weight learning for CBCC. In particular, we describe a cross-validation approach for tuning feature weights and show that it increases CBCC accuracy on these tasks.
DTIC
Classifications; Mathematical Models

20080030426 Naval Postgraduate School, Monterey, CA USA
Optimizing Systems of Threshold Detection Sensors
Banschbach, David C; Mar 2008; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479784; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479784

When implementing a system of sensors, one of the biggest challenges is to establish a threshold at which a signal is generated. All signals that exceed this detection threshold are then investigated to determine whether the signal was due to an event of interest, or whether the signal is due simply to noise. Below the threshold all signals are ignored. We develop a mathematical model for setting individual sensor thresholds to obtain optimal probability of detecting a significant event, given a limit on the total number of false positives allowed in any given time period. A large number of false signals can consume an excessive amount of resources and could undermine confidence in the system's credibility. One motivation for this problem is that it allows decision makers to explicitly optimize system detection performance while ensuring it meets organizational resource constraints. Our simulations demonstrate the methodology's performance for various sizes of sensor networks, from ten up to thousands of sensors. Such systems apply to a wide variety of homeland security and national defense problems, from biosurveillance to more classical military sensor applications.
DTIC
Detection; Optimization

20080030467 Naval Postgraduate School, Monterey, CA USA
University Course Timetabling with Probability Collectives
Autry, Brian M; Mar 2008; 55 pp.; In English
Report No.(s): AD-A479864; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479864

The Naval Postgraduate School currently uses a time consuming manual process to generate course schedules for students and professors. Each quarter, the process of timetabling approximately 2000 students into nearly 500 courses takes up to 8 weeks. This thesis introduces an automated timetabling algorithm using Probability Collectives (PC) theory. PC Theory is an agent based approach that utilizes Collective Intelligence (COIN) to solve optimization problems by using a collection of agents attempting to achieve a single goal. The algorithm was tested on a set of data provided by the organizers of the 2007 International Timetabling Competition. The algorithm provided valid timetables for every problem instance and successfully scheduled between 70% and 91.6% of all student course requests.
DTIC
Intelligence; Optimization; Probability Theory; Scheduling

20080030489 Naval Postgraduate School, Monterey, CA USA

First Responder Problem Solving and Decision Making in Today's Asymmetrical Environment

Hintze, Neil R; Mar 2008; 161 pp.; In English

Report No.(s): AD-A479926; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479926

Today's first responders confront a common challenge, namely the lack of exposure to and experience with asymmetric threats (i.e., terrorism and natural disasters) in training venues that would enable them to develop familiarity with these novel situations. Different problem-solving strategies currently employed by today's first responders are described, along with situation awareness and how to best leverage first-responder experience. Literature on expert versus novice decision making, situation awareness, recognition-primed decision making, and scenario-based learning was leveraged to design the thesis experiment. Through scenario-based exercises, the thesis attempted to discover whether the decision-making skills of an experienced fire officer (expert) can be learned by newly promoted officers (novice). Results from this experiment provided insight and plausible remedies regarding today's asymmetric threats in the form of recommendations to enhance the first responder's ability to develop good situational awareness and decision making. The goal now is to use research results and recommendations as a springboard to develop training that helps a novice to effectively respond to asymmetric threats. Experiment results indicate that, by combining scenarios designed to expose novices to situations they may not experience during routine operations with timely expert feedback, an individual's decision-making skills and situation awareness can be improved.

DTIC

Asymmetry; Decision Making; Problem Solving; Transponders

20080030495 EnOcean G.m.b.H., Munich, Germany

RF-Embedding of Energy-Autonomous Sensors and Actuators into Wireless Sensor Networks

Schmidt, Frank; Scholl, Gerd; Anders, Armin; Korber, Hans-Jorg; Wattar, Housam; Oct 1, 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A479950; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479950

No abstract available

Actuators; Autonomy; Communication Networks; Embedding; Radio Frequencies; Wireless Communication

20080030598 Naval Research Lab., Washington, DC USA

Applying Formal Methods to a Certifiably Secure Software System

Heitmeyer, Constance L; Archer, Myla M; Leonard, Elizabeth I; McLean, John D; Feb 2008; 18 pp.; In English

Report No.(s): AD-A480033; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A major problem in verifying the security of code is that the code's large size makes it much too costly to verify in its entirety. This paper describes a novel and practical approach to verifying the security of code which substantially reduces the cost of verification. In this approach, a compact security model containing only information needed to reason about the security properties of interest is constructed and the security properties are represented formally in terms of the model. To reduce the cost of verification, the code to be verified is partitioned into three categories and only the first category, which is less than 10 percent of the code in our application, requires formal verification. The proof of the other two categories is relatively trivial. Our approach was developed to support a Common Criteria evaluation of the separation kernel of an embedded software system. This paper describes 1) our techniques and theory for verifying the kernel code and 2) the artifacts produced, that is, a Top-Level Specification (TLS), a formal statement of the security property, a mechanized proof that the TLS satisfies the property, the partitioning of the code, and a demonstration that the code conforms to the TLS. This paper also presents the formal basis for the argument that the kernel code conforms to the TLS and consequently satisfies the security property.

DTIC

Computer Programs; Security; Theorems

20080030609 Naval Research Lab., Washington, DC USA

Complex Visual Data Analysis, Uncertainty, and Representation

Schunn, Christian D; Saner, Lelyn D; Kirschenbaum, Susan K; Trafton, J G; Littleton, Eliza B; Jan 2007; 54 pp.; In English

Report No.(s): AD-A480056; XB-NRL/MR/5510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

How do problem solvers represent visual-spatial information in complex problem solving tasks? This paper explores the

predictions of symbolic computation, embodied problem solving and a neurocomputational theory for what factors influence internal representation choices. Across two studies, data are collected from experts and novices in three different, complex visual-spatial problem-solving domains (weather forecasting, submarine target motion analysis, and fMRI data analysis). Internal spatial representations are coded from spontaneous gestures made during cued-recall summaries of problem solving activities. Analyses of domain differences, expertise differences, and changes over time with problem solving suggest that neurocomputational constraints play a larger role than the nature of the visual input or the nature of the underlying real world being examined through problem solving, especially for expert problem solvers. The particular neurocomptuational feature that was found to drive internal representation choice is the required spatial precision of the main goals of problem solving.
DTIC
Data Processing; Problem Solving

20080030624 Naval Postgraduate School, Monterey, CA USA
Comparison Between Wavenumber Truncation and Horizontal Diffusion Methods in Spectral Models
Chu, Peter C; Chen, Xiong-Shan; Fan, Chenwu; May 2000; 8 pp.; In English
Report No.(s): AD-A480117; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Commonly used horizontal diffusion and wavenumber truncation dealiasing methods in spectral models are verified using the National Center for Atmospheric Research Community Climate Model version 3. For the same horizontal grid resolution, time step, physical processes, boundary conditions, and initial conditions, the simulated climate, using the horizontal diffusion alone model, is better than that using the wavenumber truncation method. In comparison with the observed climate data, the global root-mean-square of simulated January monthly mean 500-hPa geopotential using the horizontal diffusion alone model is 25% less than that using the wavenumber truncation model. However, for the same spectral resolution, the wavenumber truncation model (high horizontal grid resolution) leads to more accurate solutions than the horizontal diffusion model (low horizontal grid resolution).
DTIC
Diffusion; Mathematical Models; Spectra

20080030661 Naval Postgraduate School, Monterey, CA USA
Determining the Best Loci of Knowledge, Responsibilities and Decision Rights in Major Acquisition Organizations
Dillard, John; Nissen, Mark E; Jun 30, 2005; 72 pp.; In English
Report No.(s): AD-A480306; NPS-PM-05-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The DoD is a large bureaucratic rule-intensive organization that may not be suited well for its environment. Building upon prior research of acquisition centralization and knowledge dynamics we employ computational methods to assess the behavior and performance of different organizational designs in varying environments. Our results reinforce Contingency Theory and suggest particular characteristics of different acquisition environments make one organizational form relatively more or less appropriate than another. Practically answers to our research questions have direct and immediate application to acquisition leaders and policy makers. Theoretically we generalize to broad classes of organizations and prescribe a novel set of organizational design guides.
DTIC
Defense Program; Loci; Organizations; Procurement; Simulation

20080030856 Princeton Univ., NJ USA
Radio Resource Allocation and Multiuser Detection in Very Large Scale Wireless Multiple Access Networks
Poor, H V; Betz, Sharon; Buzzi, Stefano; Massaro, Valeria; Bacci, Giacomo; Luise, Marco; Mar 2008; 98 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-06-1-0252; Proj-1038
Report No.(s): AD-A480136; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study was concerned with the use of game theoretic principles for radio resource management in wireless multiple-access networks. Our progress on this problem is described in detail in publications listed in the technical report, for each of which a link to the full document is provided. These documents examine a number of resource-allocation issues wherein the primary performance criterion is optical energy efficiency. Specific contributions include receiver designs and power allocation in multi-hop (ad hoc) networks; analysis and design of energy efficient receiver algorithms for ultra-wideband (UWB) systems in rich multi-path environments; extensions of analyses for linear receivers to serial

interference cancellers; joint transmitter and receiver optimization for energy efficient network operations; and efficient and adaptive distributed algorithms for achieving optimal designs.
DTIC
Allocations; Communication Networks; Multiple Access; Resource Allocation; Resources Management

20080030881 Massachusetts Inst. of Tech., Cambridge, MA USA
Error Analysis in the Joint Event Location/Seismic Calibration Inverse Problem
Rodi, William L; Feb 15, 2008; 38 pp.; In English
Contract(s)/Grant(s): F19628-03-C-0109; Proj-1010
Report No.(s): AD-A480194; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this project was to develop new mathematical and computational techniques for quantifying the errors in seismic event locations, focusing on the effects of errors in travel-time predictions from a velocity model. Our approach associates these model errors with the uncertainty in path travel-time corrections inferred from a calibration analysis. The main accomplishment of the project was a general formulation of location uncertainty in terms of the joint inverse problem that combines event location and seismic calibration. The formulation accommodates travel-time nonlinearity, Gaussian and non-Gaussian observational error, and a broad class of parameterizations of path travel-time corrections. We implemented the formulation for the simple correction parameterization as station time terms, applying it to data from the Nevada Test Site (NTS) as a proof of concept of the joint inversion approach. To address the computational intensity of the approach, we re-formulated it as an approximate, two-stage process - calibration followed by location - which we also implemented for the time-term case using newly designed algorithms for each stage. Application of the two-stage approach to NTS data demonstrated its much greater efficiency and suggest it as a feasible uncertainty paradigm for more complex problems in which travel-time corrections are parameterized with 3-D Earth models.
DTIC
Calibrating; Error Analysis; Position (Location)

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080030376 Army Research Lab., Adelphi, MD USA
Simulated Radar Range Profiles of a Simple Room as Compound by FDTD and Xpatch
Dogaru, Traian; Le, Calvin; Apr 2008; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479592; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479592

This technical report presents numerical simulations of the ultra-wideband (UWB) radar return from a simple room with a human inside, with application to sensing through the wall (STTW) radar scenarios. We use the Finite Difference Time Domain (FDTD) and Xpatch modeling techniques to compute the range profiles of the room at specific incidence and observation angles. Our goal is to analyze the electromagnetic phenomenology in operating an UWB radar for STTW applications. At the same time, we are interested in understanding issues specific to these computational techniques as applied to this type of problems, as well as validating Xpatch as an accurate tool for modeling general STTW radar scenarios.
DTIC
Finite Difference Theory; Finite Difference Time Domain Method; Radar Range

20080030436 Naval Postgraduate School, Monterey, CA USA
Extension of Strongly Regular Graphs
Gera, Ralucca; Shen, Jian; Feb 11, 2008; 6 pp.; In English
Report No.(s): AD-A479816; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479816

The Friendship Theorem states that if any two people in a party have exactly one common friend, then there exists a politician who is a friend of everybody. In this paper, we generalize the Friendship Theorem. Let lambda be any nonnegative integer and mu be any positive integer. Suppose each pair of friends have exactly lambda common friends and each pair of strangers have exactly mu common friends in a party. The corresponding graph is a generalization of strongly regular graphs obtained by relaxing the regularity property on vertex degrees. We prove that either everyone has exactly the same number

of friends or there exists a politician who is a friend of everybody. As an immediate consequence, this implies a recent conjecture by Limaye et. al.
DTIC
Theorems

20080030455 Advanced Science and Automation Corp., Indianapolis, IN USA
Experimental Validation of a Coupled Fluid-Multibody Dynamics Model for Tanker Trucks
Wasfy, Tamer M; O'Kins, James; Smith, Scott; Nov 8, 2007; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W56HZV-05-C-0631
Report No.(s): AD-A479840; 2008-01-0777; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479840

A time-accurate finite element model for predicting the coupled dynamic response of tanker trucks and their liquid payloads is presented along with an experimental validation of the model. The tanker truck components are modeled using rigid bodies, flexible bodies, joints and actuators. The model is validated using a full-scale army heavy class tactical trailer carrying a water tank. The trailer is placed on an n-post motion base simulator which was used to perform harmonic/ramp pitch, roll and stir excitations of the trailer in order to simulate typical road maneuvers. Experiments were carried out with an empty tank and a 65%-filled tank. The time-histories of the tires and suspension system deflections are measured for the various input motion excitations. The experiment's measurements are compared with the results predicted using the computational model. The comparison shows that the model can predict with reasonably good accuracy the test tanker-trailer's dynamic response.
DTIC
Finite Element Method; Fluid Dynamics; Trucks

20080030607 Naval Research Lab., Washington, DC USA
Shedding Light on the Graph Schema: Perceptual Features vs. Invariant Structure
Ratwani, Raj M; Trafton, J G; Jan 2008; 25 pp.; In English
Report No.(s): AD-A480054; XB-NRL/MR/5510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Most theories of graph comprehension posit the existence of a graph schema to account for people's prior knowledge of how to understand different graph types. The graph schema is, however, a purely theoretical construct: there are no empirical studies that have explicitly examined the nature of the graph schema. We sought to determine whether graph schemas are based on perceptual features or on a common invariant structure shared between certain graphs. The process of activating the graph schema was isolated as participants responded to graphs presented in pure and mixed blocks. Any differences in reaction time between the blocks could be attributed to loading the appropriate schema. Results from a series of experiments using five types of graphs suggest graph schemas are based on the graphical framework, a common invariant structure among certain types of graphs. These results provide insight into the comprehension of novel graphs.
DTIC
Graph Theory

20080030608 Naval Research Lab., Washington, DC USA
Thinking Graphically: Connecting Vision and Cognition during Graph Comprehension
Ratwani, Raj M; Trafton, J G; Boehm-Davis, Deborah A; Jan 2008; 56 pp.; In English
Report No.(s): AD-A480055; XB-NRL/MR/5510; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Task analytic theories of graph comprehension account for the perceptual and conceptual processes required to extract specific information from graphs. Comparatively, the processes underlying information integration have received less attention. We propose a new framework for information integration that highlights visual integration and cognitive integration. During visual integration, pattern recognition processes are used to form visual clusters of information; these visual clusters are then used to reason about the graph during cognitive integration. In three experiments the processes required to extract specific information and to integrate information were examined by collecting verbal protocol and eye movement data. Results supported the task analytic theories for specific information extraction and the processes of visual and cognitive integration for integrative questions. Further, the integrative processes scaled up as graph complexity increased, highlighting the importance of these processes for integration in more complex graphs. Finally, based on this framework, design principles to improve both visual and cognitive integration are described.
DTIC
Cognition; Connectors; Graph Theory; Vision

20080030623 Naval Postgraduate School, Monterey, CA USA
An Accuracy Progressive Sixth-Order Finite-Difference Scheme
Chu, Peter C; Fan, Chenwu; Dec 2000; 14 pp.; In English
Report No.(s): AD-A480116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

How to reduce the computational error is a key issue in numerical modeling and simulation. The higher the order of the difference scheme, the less the truncation error and the more complicated the computation. For compromise, a simple, three-point accuracy progressive (AP) finite-difference scheme for numerical calculation is proposed. The major features of the AP scheme are three-point, high-order accuracy, and accuracy progressive. The lower-order scheme acts as a 'source' term in the higher-order scheme. This treatment keeps three-point schemes with high accuracy. The analytical error estimation shows the sixth-order accuracy that the AP scheme can reach. The Fourier analysis of errors indicates the accuracy improvement from lower-order to higher-order AP schemes. The Princeton Ocean Model (POM) implemented for the Japan/East Sea (JES) is used to evaluate the AP scheme. Consider a horizontally homogeneous and stably stratified JES with realistic topography. Without any forcing, initially motionless ocean will keep motionless forever; that is to say, there is a known solution (V = 0). Any nonzero model velocity can be treated as an error. The stability and accuracy are compared with those of the second-order scheme in a series of calculations of unforced flow in the JES. The three-point sixth order AP scheme is shown to have error reductions by factors of 10-20 compared to the second-order difference scheme. Due to their three-point grid structure, the AP schemes can be easily applied to current ocean and atmospheric models.
DTIC
Finite Difference Theory; Ocean Models

20080030653 Naval Postgraduate School, Monterey, CA USA
Hydrostatic Correction for Sigma Coordinate Ocean Models
Chu, Peter C; Fan, Chenwu; Jan 2003; 13 pp.; In English
Report No.(s): AD-A480217; No Copyright; Avail.: Defense Technical Information Center (DTIC)

How to reduce the horizontal pressure gradient error is a key issue in terrain-following coastal models. The horizontal pressure gradient splits into two parts, and incomplete cancellation of the truncation errors of those parts cause the error. Use of the finite volume discretization leads to a conserved scheme for pressure gradient computation that has better truncation properties with high accuracy. The analytical coastal topography and seamount test cases are used to evaluate the new scheme. The accuracy of the new scheme is comparable to the sixth order combined compact scheme (with an error reduction by a factor of 70 comparing to the second order scheme) with mild topography and much better than the sixth-order combined compact scheme with steep topography. The computational efficiency of the new scheme is comparable to the second-order difference scheme. The two characteristics, high accuracy and computational efficiency, make this scheme useful for the sigma coordinate ocean models.
DTIC
Correction; Errors; Hydrostatics; Ocean Models; Oceanography; Pressure Gradients; Topography

20080030660 Air Force Electronic Warfare Evaluation Simulator (AFEWES), Forth Worth, TX USA
PC Based Infrared Scene Generation Development
Blair, Tom; Yeary, Bill; Jan 2002; 6 pp.; In English
Report No.(s): AD-A480303; XC-AFEWES/412TW; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Air Force Electronic Warfare Evaluation Simulator (AFEWES) is a government-owned, contractor-operated electronic warfare test facility located at Air Force Plant 4, in Fort Worth, Texas. The AFEWES is a Test and Evaluation (T&E) resource of the Air Force Flight Test Center (AFFTC), 412 Electronic Warfare Group (EWG), Edwards Air Force Base, California. AFEWES' mission is to perform effectiveness testing of Department of Defense (DoD) and allied electronic countermeasure techniques to enhance aircraft and aircrew survivability in combat. This paper describes the multi-service and contractor team that successfully defined, designed, developed, tested and implemented state of the art infrared PC based scene generator to be used by DoD. The paper also highlights: Team requirements and low cost solution, Leveraging government owned assets and developing partnerships across DoD.
DTIC
Electronic Countermeasures; Electronic Warfare; Infrared Radiation; Scene Generation

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20080029291 London Univ., UK
W Mass and Width Measurements at the Tevatron
Nurse, E.; May 21, 2007; 4 pp.; In English
Report No.(s): DE2007-908368; FERMILAB-CONF-07-150-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The mass and width of the W boson are important parameters of the Standard Model (SM). Radiative corrections of the W propogator are dominated by Higgs and top-bottom loops, thus a precise measurement of mass together with width, the mass of the top quark, place an indirect constraint on the mass of the as yet un-discovered Higgs boson. A precise measurement of width provides a stringent test of the SM prediction which is accurate to 2 MeV(sub 1).
NTIS
Higgs Bosons; Particle Accelerators

20080029292 Karlsruhe Univ., Germany
Measurement of the W-Boson Helicity Fractions in Top-Quark Decays at CDF
Chwalek, T.; January 2007; 4 pp.; In English
Report No.(s): DE2007-908366; FERMILAB-CONF-07-151-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Since the discovery of the top quark in 1995 by the CDF and D0 collaborations, the mass of this most massive known elementary particle has been measured with high precision. However, the measurements of other top-quark properties are still statistically limited, so the question remains whether the standard model successfully predicts these properties. In the following we present our measurement of the helicity fractions of W bosons from top-quark decay.
NTIS
Bosons; Particle Decay; Quarks

20080029323 Istituto Nazionale di Fisica Nucleare, Pisa, Italy; Fermi National Accelerator Lab., Batavia, IL, USA
Measurements of B Rare Decays at the Tevatron
Scuri, F.; January 2007; 4 pp.; In English
Report No.(s): DE2007-908687; No Copyright; Avail.: National Technical Information Service (NTIS)

The large production of all kinds of b-hadrons at the Tevatron offers the opportunity to study rare decays also in the B(s) and b-baryon sectors, exploiting a physics program complementary to the B-Factories.
NTIS
Baryons; Particle Accelerators; Decay

20080029324 Army Research Lab., Adelphi, MD USA
Landau-Devonshire Parameters for the Tunable Paraelectric Material BaTi.9(Sc,Ta).05O3
Miller, Virginia; Crowne, Frank; Mar 2008; 20 pp.; In English
Report No.(s): AD-A479116; ARL-TR-4410; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479116

Measured values of the nonlinear electrical response of the perovskite ferroelectric compound BaTi.9(Sc,Ta).05O3 are used to deduce the thermodynamic Landau-Devonshire parameters of the material, which are found to differ strongly from those of the parent material BaTiO3, despite the small amount of added Sc and Ta. The compound is found to cubic, with a low transition temperature of 60 deg. C. An explanation for this behavior is advanced based on quenching of electrostriction.
DTIC
Ferroelectric Materials; Perovskites

20080029338 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; Lumidigm, Inc., Albuquerque, NM, USA
Multispectral Liveness Determination
Rowe, R. K., Inventor; 25 Apr 05; 35 pp.; In English
Contract(s)/Grant(s): FA8750-04-C-0190
Patent Info.: Filed Filed 25 Apr 05; US-Patent-Appl-SN-11-115-075
Report No.(s): PB2007-110624; No Copyright; Avail.: CASI: A03, Hardcopy

Methods and systems are provided for determining a liveness state of purported tissue. The purported tissue is illuminated under a plurality of distinct optical conditions during a single illumination session. Light scattered from the purported tissue is received separately for each of the plurality of distinct optical conditions. A multispectral image of the purported tissue is derived from the received light. It is verified that the derived multispectral image is consistent with living tissue.
NTIS
Multispectral Band Scanners; Patent Applications

20080030448 Army Tank-Automotive Research and Development Command, Warren, MI USA
Fatigue Life Prediction for Armored Vehicle Launched Bridge (AVLB) for MLC 70 and MLC 80 Loads
Sia, Bernard; Apr 16, 2008; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479832; TARDEC-18828; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479832

Due to increased vehicle weight and the need to increase load carrying capacity, interest has been shown to increase the AVLB's load rating without any design changes. This may have an adverse effect on the AVLB's fatigue life.
DTIC
Fatigue Life; Loads (Forces); Predictions

20080030475 Army Tank-Automotive Research and Development Command, Warren, MI USA
Analysis of Passive Vibration Measurement and Data Interrogation Issues in Health Monitoring of a HMMWV Using a Dynamic Simulation Model
Adams, D; Gothamy, J; Decker, P; Lamb, D; Gorsich, D; Apr 2008; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479888; TARDEC-18705; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479888

HMMWV come in over a dozen variants: some are heaviers than others; there is variation in loading; durability of suspension; frame and cross members. A method is desirable through which passive vibration response is used to detect faults.
DTIC
Dynamic Models; Fault Detection; Health; Interrogation; Simulation; Vibration; Vibration Measurement

20080030493 Naval Postgraduate School, Monterey, CA USA
Modeling and Simulation of Survivable Armor Design Studies for IED Threats
Kaminski, Douglas L; Mar 2008; 85 pp.; In English
Report No.(s): AD-A479938; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479938

Improvised Explosive Device (IED) is used as a strategic weapon of choice and continues to be a threat both globally and domestically. One of the deadly devices in this arsenal is the Explosively Formed Projectile (EFP). This study develops methodology for modeling and simulation of armor plates to survive EFP threats. The EFP effects are modeled as a pressure or blast wave using compressible isentropic conservation equations to get pressure loadings. The thermal effects are modeled as temperature intensities and resulting transient heat transfer analysis is conducted to obtain temperature distribution. The kinetic loads are modeled as high initial velocities applied to the plate. The combined mechanical and thermal loading is analyzed. The design space is generated for varying materials properties and thicknesses as parameters. Laminated composite and orthotropic composites are also used in addition to special high strength and high stiffness generic alloys. The analysis is done using both two-dimensional plate theories as well as three-dimensional transient dynamic analysis. The results are presented showing maximum stresses and deformations for different combinations of materials and thicknesses. The results also indicate the need to use three-dimensional analysis for designing survivable armor. Some recommendations are made for further studies.
DTIC
Armor; Computerized Simulation; Explosive Devices; Simulation; Thermal Analysis

20080030667 Naval Postgraduate School, Monterey, CA USA
Oceanic Responses to Gradual Transitions of Equator-to-Pole Temperature-Gradients
Cai, W; Chu, P C; Jan 1998; 13 pp.; In English
Report No.(s): AD-A480344; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Responses of an ocean model to gradual transitions of equator-to-pole gradients show that several quasi-equilibrium states within the thermally driven regime are generated under identical forcing conditions. These different states are associated with different patterns (the location and the penetration depth) of oceanic convection. Small changes in the thermal forcing conditions can push the system into an oscillatory regime. Once in this regime, oscillations appear to proceed as internal processes. One important implication of these results is that the present day ocean climate may not recover fully if the atmospheric CO2 level, after doubling , is lowered to the present-day level.
DTIC
Equators; Ocean Models; Oscillations; Temperature Gradients; Transition Temperature

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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*.

20080026325 California Univ., Berkeley, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA
Matrix Switched Phased Array Ultrasonic Guided Wave System
Quarry, M. J., Inventor; 1 Jun 05; 12 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 1 Jun 05; US-Patent-Appl-SN-11-143-544
Report No.(s): PB2007-110520; No Copyright; Avail.: CASI: A03, Hardcopy

A system for nondestructively evaluating a sample. An ultrasonic array is used for directing and receiving guided waves to the sample. A matrix switch is used to sequence through the array of transducers and reconstruct the modal waveform by introducing the appropriate time delay for the desired mode. The sequencing sweeps through the dispersion space of all possible guided wave modes for a given plate. The sequencing is used to determine the parameters (frequency and time delay) that will excite the optimal guided wave mode for inspecting a given structure.
NTIS
Inspection; Matrices (Circuits); Patent Applications; Phased Arrays; Switching; Switching Circuits; Ultrasonic Radiation; Ultrasonics

20080030156 Boeing Co., Huntington Beach, CA, USA
Computation of Sound Propagation by Boundary Element Method
Guo, Yueping; September 2005; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-00086; 581-02-08; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030156

This report documents the development of a Boundary Element Method (BEM) code for the computation of sound propagation in uniform mean flows. The basic formulation and implementation follow the standard BEM methodology; the convective wave equation and the boundary conditions on the surfaces of the bodies in the flow are formulated into an integral equation and the method of collocation is used to discretize this equation into a matrix equation to be solved numerically. New features discussed here include the formulation of the additional terms due to the effects of the mean flow and the treatment of the numerical singularities in the implementation by the method of collocation. The effects of mean flows introduce terms in the integral equation that contain the gradients of the unknown, which is undesirable if the gradients are treated as additional unknowns, greatly increasing the sizes of the matrix equation, or if numerical differentiation is used to approximate the gradients, introducing numerical error in the computation. It is shown that these terms can be reformulated in terms of the unknown itself, making the integral equation very similar to the case without mean flows and simple for numerical implementation. To avoid asymptotic analysis in the treatment of numerical singularities in the method of collocation, as is conventionally done, we perform the surface integrations in the integral equation by using sub-triangles so that the field point never coincide with the evaluation points on the surfaces. This simplifies the formulation and greatly facilitates the implementation. To validate the method and the code, three canonic problems are studied. They are respectively the sound scattering by a sphere, the sound reflection by a plate in uniform mean flows and the sound propagation over a hump of

irregular shape in uniform flows. The first two have analytical solutions and the third is solved by the method of Computational Aeroacoustics (CAA), all of which are used to compare the BEM solutions. The comparisons show very good agreements and validate the accuracy of the BEM approach implemented here.
Author
Sound Propagation; Boundary Element Method; Acoustic Scattering; Aeroacoustics; Boundary Conditions; Computation; Integral Equations; Wave Equations

20080030476 Massachusetts Inst. of Tech., Cambridge, MA USA
Assessing the Impact of Auditory Peripheral Displays for UAV Operators
Graham, H D; Cummings, M L; Nov 2007; 51 pp.; In English
Report No.(s): AD-A479889; HAL2007-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479889

A future implementation of unmanned aerial vehicle 'UAV' operations is having a single operator control multiple UAVs. The research presented here explores possible avenues of enhancing audio cues of UAV interfaces for this futuristic control of multiple UAVs by a single operator. This project specifically evaluates the value of continuous and discrete audio cues as indicators of course deviations or late arrivals to targets for UAV missions. It also looks at the value of the audio cues in single and multiple UAV scenarios. To this end, an experiment was carried out on the Multiple Autonomous Unmanned Vehicle Experimental 'MAUVE' test bed developed in the Humans and Automation Laboratory at the Massachusetts Institute of Technology with 44 military participants. Specifically, two continuous audio alerts were mapped to two human supervisory tasks within MAUVE. One of the continuous audio alerts, an oscillating course deviation alert was mapped to UAV course deviations which occurred over a continual scale. The other continuous audio alert tested was a modulated late arrival alert which alerted the operator when a UAV was going to be late to a target. In this case the continuous audio was mapped to a discrete event in that the UAV was either on time or late to a target. The audio was continuous in that it was continually on and alerting the participant to the current state of the UAV. It either was playing a tone indicating the UAV was on time to a target or playing a tone indicating the UAV was late to a target. These continuous alerts were tested against more traditional single beep alerts which acted as discrete alerts. The beeps were discrete in that when they were used for monitoring course deviations a single beep was played when the UAV got to specific threshold off of the course or for late arrivals a single beep was played when the UAV became late.
DTIC
Acoustics; Aircraft; Display Devices; Warning Systems

20080030485 Naval Postgraduate School, Monterey, CA USA
Assessment of the Performance of the Near-Bottom Hydrophones of the U.S. Navy Southern California Offshore Range in Detecting, Localizing and Reconstructing 10-20 kHz Odontocete Whistles
Hager, Carl A; Mar 2008; 81 pp.; In English
Report No.(s): AD-A479908; XB-ERD(N45); No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479908

A series of 10 to 20 kHz, frequency-sweeping signals synthesizing whistles of vocalizing Odontocetes was transmitted from a J-9 sound projector suspended from the Research Vessel Pt Sur while over the U.S. Navy Southern California Offshore Range (SCORE) Underwater Acoustic Range from 11 to 13 August 2004. The transmissions were recorded by a group of seven near-bottom hydrophones of the Range. Using statistical analysis on ensembles of the repeated transmissions, the relationship between probability of detection p(D), probability of false alarm p(FA), signal-to-noise ratio (SNR) of the band-passed hydrophone data and detection range were derived for both a correlator and energy detector. To extrapolate the detection range for a different SL, a ray propagation model was employed. Additionally, the feasibility of using the near-bottom hydrophones of the Range for three-dimensional localization and for reconstructing the source signal waveform was assessed. While the experimental results show that accurate horizontal location estimates can be easily obtained through a minimization of the misfit between the observed and predicted differences in the signal arrival times at a cluster of hydrophones, a high-quality depth estimate is more difficult to accomplish. In order to choose a satisfactory depth estimator, simulated data were used to systematically quantify the sensitivity of the source depth estimates, produced by a set of commonly used frequency and time-domain processing methods to additive noise, sound-speed profile mismatch and hydrophone position errors. The simulation results suggest that a time-domain signal magnitude matching scheme consistently outperforms the other methods. The performance of this scheme was further demonstrated with experimental data. For source

signal waveform reconstruction, the sensitivity of a frequency-uncorrelated, least-squares technique to the same errors was investigated.
DTIC
Detection; Hydrophones; Marine Mammals; Navy; Position (Location); Underwater Acoustics

20080030575 Naval Postgraduate School, Monterey, CA USA
Passive and Active Sonar Prosecution of Diesel Submarines by Nuclear Submarines
Nelson, Erik J; Mar 2008; 72 pp.; In English
Report No.(s): AD-A479975; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This study analyses the trend for initial detection times using both passive and active sonar during submarine onsubmarine operations. Specifically, it simulates a nuclear powered submarine (SSN) searching for a diesel submarine in an environment where the SSN has a speed advantage and active sonar detection ranges exceed passive sonar detection ranges. The simulation uses a mover-sensor discrete event application of SIMKIT, developed by Professor Arnold Buss. The simulation results show that initial detection times of a search follow an exponential trend as a function of SSN speed, diesel submarine speed, detection ranges, ping interval and detection probability. As a result, as detection ranges continue to decrease due to increases in sound quieting technology, initial detection times during a submarine search will increase exponentially. This can render a passive sonar prosecution ineffective when combating a modern diesel submarine. Should an SSN use active sonar, initial detection times can be significantly reduced, especially if combined with an effective search path. The threat to the SSN of using active sonar can be mitigated by judicious consideration of ping interval and search speed with detection probability and active detection ranges. All values used to arrive at the conclusions stated are notional, and no classified information sources were consulted as part of this work.
DTIC
Diesel Engines; Sonar; Submarines

20080030577 Naval Postgraduate School, Monterey, CA USA
Statistics of Acoustic Pulse Signals Through Nonlinear Internal Waves on the Continental Shelf of the Northeastern South China Sea
Reeves, Justin M; Mar 2008; 124 pp.; In English; Original contains color illustrations
Report No.(s): AD-A479987; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A component of the Office of Naval Research (ONR) funded Windy Islands Soliton Experiment (WISE) was conducted from 13 - 15 April 2005 on the continental shelf in the northeast portion of the South China Sea to study the effects of nonlinear internal waves on the transmission of a 400-Hz signal. To capture the ocean variability along the acoustic path, a series of environmental moorings were deployed that sampled the water column. Significant variability in the sound-speed field was observed to be induced by nonlinear internal tides with a broad (~ 10 km) horizontal scale (referred to as the 'long-wave pattern') and narrow (< 1 km), high-frequency, nonlinear internal depression and elevation waves superimposed on the internal tides. Through the use of an empirical sound-speed field and a coupled, normal-mode acoustic propagation model, the phenomenology of the nonlinear internal wave field upon the observed intensity pattern was examined. Analysis of the observed and modeled acoustic intensity time-series indicates that the long-wave pattern dictates, to a large degree, the temporal changes in the vertical structure of the sound intensity level. Furthermore, both measurement and model results show that when the thermocline was rapidly displaced by the nonlinear internal waves, sound intensity fluctuations reached their maximum. Modeling results suggest that these maximums are due to the scattering of acoustic energy into both higher and lower acoustic modes along the edges of the elevation/depression waves where strong horizontal sound-speed gradients were present. An additional goal of this paper is to propose and validate an extended statistical theory that relates the observed statistics of the acoustic intensity to the number of resolvable arrivals. The number of resolvable arrivals depends on signal bandwidth and the criteria of well separateness and was found to vary significantly as the nonlinear internal waves evolve along the transmission path.
DTIC
China; Continental Shelves; Internal Waves; Nonlinearity; Seas; Signal Transmission; Sound Waves

20080030599 Naval Postgraduate School, Monterey, CA USA
Investigation of the Transmission of Sound Through Isotropic, Damped Material Layer(s) Bounded by Seawater
Roche, Gerald J; Mar 2008; 69 pp.; In English; Original contains color illustrations
Report No.(s): AD-A480034; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Acoustic 'windows' are used in SONAR applications to absorb structural loads associated with the platform operation

while allowing the passage of acoustic signals. The performance metric commonly used to gauge the acoustic window quality is insertion loss. This thesis provides a derivation of insertion loss for multi-layered materials as a function of frequency and angle of incidence. Derivations are modified to include attenuation of the signals in the material and the result has been written into a MATLAB model. Measurements on single layer plastic, polyurethane and steel panels show good experimental agreement with the theoretical model. The model is then used to predict insertion loss of multiple layers as a tool for improving window bending rigidity.
DTIC
Acoustics; Audio Frequencies; Isotropy; Sea Water; Sound Transmission

20080030794 NASA Glenn Research Center, Cleveland, OH, USA
Low Frequency Noise Contamination in Fan Model Testing
Brown, Clifford A.; Schifter, Nicholas A.; June 2008; 19 pp.; In English; ASME Turbo Expo 2008 Gas Turbine Congress and Exposition, 9-13 Jun. 2008, Berlin, Germany; Original contains color illustrations
Contract(s)/Grant(s): WBS 984754.02.07.03.17.03
Report No.(s): NASA/TM-2008-215255; GT2008-50850; E-16517; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030794

Aircraft engine noise research and development depends on the ability to study and predict the noise created by each engine component in isolation. The presence of a downstream pylon for a model fan test, however, may result in noise contamination through pylon interactions with the free stream and model exhaust airflows. Additionally, there is the problem of separating the fan and jet noise components generated by the model fan. A methodology was therefore developed to improve the data quality for the 9 15 Low Speed Wind Tunnel (LSWT) at the NASA Glenn Research Center that identifies three noise sources: fan noise, jet noise, and rig noise. The jet noise and rig noise were then measured by mounting a scale model of the 9 15 LSWT model fan installation in a jet rig to simulate everything except the rotating machinery and in duct components of fan noise. The data showed that the spectra measured in the LSWT has a strong rig noise component at frequencies as high as 3 kHz depending on the fan and airflow fan exit velocity. The jet noise was determined to be significantly lower than the rig noise (i.e., noise generated by flow interaction with the downstream support pylon). A mathematical model for the rig noise was then developed using a multi-dimensional least squares fit to the rig noise data. This allows the rig noise to be subtracted or removed, depending on the amplitude of the rig noise relative to the fan noise, at any given frequency, observer angle, or nozzle pressure ratio. The impact of isolating the fan noise with this method on spectra, overall power level (OAPWL), and Effective Perceived Noise Level (EPNL) is studied.
Author
Aerodynamic Noise; Jet Aircraft Noise; Effective Perceived Noise Levels; Pressure Ratio; Noise Intensity; Engine Noise; Air Flow; Aircraft Models

20080030796 NASA Langley Research Center, Hampton, VA, USA
Vibroacoustic Response Data of Stiffened Panels and Cylinders
July 28, 2008; 8 pp.; In English; Noise-Con 2008, 28-31 Jul. 2008, Dearborn, MI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 877868.02.07.07.04.01; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030796

NASA has collected vibroacoustic response data on a variety of complex, aerospace structures to support research into numerical modeling of such structures. This data is being made available to the modeling community to promote the development and validation of analysis methods for these types of structures. Existing data from two structures is described, as well as plans for a data set from a third structure. The first structure is a 1.22 m by 1.22 m stiffened aluminum panel, typical of a commercial aircraft sidewall section. The second is an enclosed, stiffened aluminum cylinder, approximately 3.66 m long and 1.22 m in diameter, constructed to resemble a small aircraft fuselage with no windows and a periodic structure. The third structure is a filament-wound composite cylinder with composite stiffeners. Numerous combinations of excitation and response variables were measured on the structures, including: shaker excitation; diffuse acoustic field; velocity response from a laser vibrometer; intensity scans; and point acceleration.
Author
Acoustics; Vibrational Stress; Sound Fields; Aircraft Structures; Mathematical Models; Fuselages

20080030797 NASA Langley Research Center, Hampton, VA, USA

Vibration Response Models of a Stiffened Aluminum Plate Excited by a Shaker

Cabell, Randolph H.; July 28, 2008; 12 pp.; In English; Noise-Con 2008, 28-31 Jul. 2008, Dearborn, MI, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 877868.02.07.07.04.01; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030797

Numerical models of structural-acoustic interactions are of interest to aircraft designers and the space program. This paper describes a comparison between two energy finite element codes, a statistical energy analysis code, a structural finite element code, and the experimentally measured response of a stiffened aluminum plate excited by a shaker. Different methods for modeling the stiffeners and the power input from the shaker are discussed. The results show that the energy codes (energy finite element and statistical energy analysis) accurately predicted the measured mean square velocity of the plate. In addition, predictions from an energy finite element code had the best spatial correlation with measured velocities. However, predictions from a considerably simpler, single subsystem, statistical energy analysis model also correlated well with the spatial velocity distribution. The results highlight a need for further work to understand the relationship between modeling assumptions and the prediction results.

Author

Vibration; Space Programs; Dynamic Structural Analysis; Acoustics; Mean Square Values; Finite Element Method

20080030947 NASA Langley Research Center, Hampton, VA, USA

Design of an Indoor Sonic Boom Simulator at NASA Langley Research Center

Klos, Jacob; Sullivan, Brenda M.; Shepherd, Kevin P.; July 28, 2008; 12 pp.; In English; Noise-Con 2008, 28-31 Jul. 2008, Dearborn, MI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 984754.02.07.07.18.02; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030947

Construction of a simulator to recreate the soundscape inside residential buildings exposed to sonic booms is scheduled to start during the summer of 2008 at NASA Langley Research Center. The new facility should be complete by the end of the year. The design of the simulator allows independent control of several factors that create the indoor soundscape. Variables that will be isolated include such factors as boom duration, overpressure, rise time, spectral shape, level of rattle, level of squeak, source of rattle and squeak, level of vibration and source of vibration. Test subjects inside the simulator will be asked to judge the simulated soundscape, which will represent realistic indoor boom exposure. Ultimately, this simulator will be used to develop a functional relationship between human response and the sound characteristics creating the indoor soundscape. A conceptual design has been developed by NASA personnel, and is currently being vetted through small-scale risk reduction tests that are being performed in-house. The purpose of this document is to introduce the conceptual design, identify how the indoor response will be simulated, briefly outline some of the risk reduction tests that have been completed to vet the design, and discuss the impact of these tests on the simulator design.

Author

Sonic Booms; Simulators; Vibration; Buildings; Exposure; Construction; Overpressure

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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*.

20080026330 Ladas and Parry, Los Angeles, CA, USA

Resonantly Enhanced Grating Coupler

Witzens, J., Inventor; Scherer, A., Inventor; 29 Apr 05; 16 pp.; In English

Contract(s)/Grant(s): AFOSR-49620-08-1-0418; NSF-ECS-03351100

Patent Info.: Filed Filed 29 Apr 05; US-Patent-Appl-SN-11-119-380

Report No.(s): PB2007-110121; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus and method for increasing efficiency of grating couplers are disclosed. The apparatus through the use of a defect or a reflective element allows coupling of light around a normal or nearly normal angle with a high efficiency. The method disclosed teaches how to increase the efficiency of a grating coupler through the use of a defect or a mirror. The

apparatus and method can be of particular utility in the context of optical clocking implemented with a III-V chip flip-chip bonded on a CMOS chip.
NTIS
Couplers; Patent Applications; CMOS; Chips

20080029293 Illinois Univ., Urbana-Champaign, IL, USA
Fast Laser Excitation and Ultrahigh Strain-Rate Deformation. Annual Scientific Report April 1, 2006 - March 31, 2007
Averback, R.; January 2007; 6 pp.; In English
Report No.(s): DE2007-908218; No Copyright; Avail.: National Technical Information Service (NTIS)

Phase evolution induced by single or repeated excitation with energetic femtosecond laser pulses is examined. Of primary interest is the solidification behavior of pure metals at deep undercoolings and self-organization in simple eutectic alloys. Time resolved measurements using third harmonic generation (THG) of light and ultrafast electron diffraction (UED) are employed to elucidate several issues related to fast laser excitation, including heat transport by ballistic and diffusional electrons through multilayer films, the dependence of crystallization velocities on materials properties, mechanisms controlling the transport of heat away from the crystal-liquid interface, and the possibility for quenching pure metals, such as Cu, Ni, and Fe, into the amorphous state. Special samples designed to maximize the quenching speed are developed. The properties of such pure metallic glasses, such as glass and crystallization temperatures, will be measured, if such samples are successfully produced. The measurements are complemented by molecular dynamics computer simulations of the solidification process. The second interest of this research is mesoscopic, self-organization of materials under repeated laser melting, with diffusional relaxation between pulses. We select binary alloys that are immiscible in the solid state but miscible in the liquid state, such as Ag-Cu. Femtosecond laser irradiation is employed to induce melting and to vary the melting time over a wide range, from a few ps to hundreds of ps. This enables us to perform critical experimental tests of key theoretical predictions self-organization in alloys under external forcing, in particular the existence of a threshold value of the forced mixing length for patterning to take place.
NTIS
Deformation; Excitation; Lasers

20080029305 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA
Optical Apparatus for Laser Scattering By Objects Having Complex Shapes
Ellingson, W. A., Inventor; Visher, R. J., Inventor; 10 Jun 04; 9 pp.; In English
Contract(s)/Grant(s): DOE-W-31-109-ENG-38
Patent Info.: Filed Filed 10 Jun 04; US-Patent-Appl-SN-10-865 651
Report No.(s): PB2007-110684; No Copyright; Avail.: CASI: A02, Hardcopy

Apparatus for observing and measuring in realtime surface and subsurface characteristics of objects having complex shapes includes an optical fiber bundle having first and second opposed ends. The first end includes a linear array of fibers, where the ends of adjacent fibers are in contact and are aligned perpendicular to the surface of the object being studied. The second ends of some of the fibers are in the form of a polished ferrule forming a multi-fiber optical waveguide for receiving laser light. The second ends of the remaining fibers are formed into a linear array suitable for direct connection to a detector, such as a linear CMOS-based optical detector. The output data is analyzed using digital signal processing for the detection of anomalies such as cracks, voids, inclusions and other defects.
NTIS
Laser Outputs; Light Scattering; Masers; Optical Fibers; Shapes

20080029315 Artz and Artz, P.C., Southfield, VA, USA
SLS of Tooling Applications
Macke, J. G., Inventor; Buchheit, J. G., Inventor; Samson, N., Inventor; 23 Jun 04; 9 pp.; In English
Patent Info.: Filed Filed 23 Jun 04; US-Patent-Appl-SN-10-710-163
Report No.(s): PB2007-110116; No Copyright; Avail.: CASI: A02, Hardcopy

A system for sintering a tool within a laser sintering system includes a chamber enclosing a sinter material. The laser sintering system grows or sinters the tool from the sinter material in response to signals from a controller. The controller

generates these signals as a function of a predetermined tool design. A heat sink is positioned within the chamber to cool features of the tool, thereby limiting warping of these features during sintering of the tool.
NTIS
Lasers; Patent Applications; Sintering; Tooling

20080029340 Gallagher and Kennedy, P.A., Phoenix, AZ, USA
Nanoengineered Biophotonic Hybrid Device
LaBelle, J. T., Inventor; Pizziconi, V. B., Inventor; 8 Sep 03; 30 pp.; In English
Contract(s)/Grant(s): NSF-9602258; NSF-9986614
Patent Info.: Filed Filed 8 Sep 03; US-Patent-Appl-SN-10-658 541
Report No.(s): PB2007-113844; No Copyright; Avail.: CASI: A03, Hardcopy

An improved method for the design and development of high performance hybrid devices having biological and nonbiological components. A figure of merit is developed for the biological component or components. The component is subjected to various environmental variables as it or its biological source organism is grown. The biological component is force adapted to cause its figure of merit to reach a goal or an acceptable measure. The biological component is used in hybrid constructs that may be nanostructures, given the small size of the biological parts. In one specific embodiment, force-adapted chlorosomes of C. aurantiacus enhance performance of a silicon photovoltaic cell. The bacteria, Chloroflexus aurantiacus (C. aurantiacus), strain J-10-f1, has the A.T.C.C. designation number 29366, having been deposited in July, 1976.
NTIS
Patent Applications; Nanostructures (Devices); Organisms

20080030118 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Modeling Activities for NASA's James Webb Space Telescope (JWST), 3, Wavefront Aberrations due to Alignment and Figure Compensation
Howard, Joseph; August 26, 2007; 1 pp.; In English; SPIE Optics and Phontonics, 26-30 Aug. 2007, San Diego, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This is part three of a series describing the ongoing optical modeling activities for James Webb Space Telescope (JWST). The first two discussed modeling JWST on-orbit performance using wavefront sensitivities to predict line of sight motion induced blur, and stability during thermal transients. The work here investigates the aberrations resulting from alignment and figure compensation of the controllable degrees of freedom (primary and secondary mirrors), which may be encountered during ground alignment and on-orbit commissioning of the observatory. The optical design of the telescope is a three-mirror anastigmat, with an active fold mirror at the exit pupil for fine guiding. The primary mirror is over 6.5 meters in diameter, and is composed of 18 hexagonal segments that can individually positioned on hexapods, as well as compensated for radius of curvature. This effectively gives both alignment and figure control of the primary mirror. The secondary mirror can be moved in rigid body only, giving alignment control of the telescope. The tertiary mirror is fixed, however, as well as the location of the science instrumentation. Simulations are performed of various combinations of active alignment corrections of component figure errors, and of primary mirror figure corrections of alignment errors. Single field point and moderate field knowledge is assumed in the corrections. Aberrations over the field are reported for the varying cases, and examples presented. Author
James Webb Space Telescope; Optical Equipment; Design Analysis; Mirrors; Alignment; Optical Properties

20080030121 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Characterizing the Hertz-VPM Polarimeter
Krejny; Novak; Chuss; Voellmer; Moseley; Wollack; Benford; Stauguhn; Jackson; Loewenstein; Walker; Drouet d'Aubigny; Golish; January 07, 2008; 1 pp.; In English; American Astronomical Society Conference, 7-11 Jan. 2008, Austin, TX, USA; Copyright; Avail.: Other Sources; Abstract Only

We present preliminary results from engineering tests conducted at Northwestern U. and the Submillimeter Telescope Observatory (SMTO) on Mt. Graham, AZ. The VPM provides a new method for modulating incoming polarization signals, using small linear translations instead of rotational motion. Our dual grid-mirror design has several advantages over the currently favored technology, the half-wave plate. The VPM appears to successfully modulate submillimeter polarization, with high efficiencies and low instrumental polarization. We briefly discuss feasibility of use for air- and space-born applications. Author
Polarimeters; Characterization; Technology Assessment; Optical Properties

20080030247 NASA Goddard Space Flight Center, Greenbelt, MD, USA

New Worlds Observer Telescope and Instrument Optical Design Concepts

Howard, Joseph; Kilston, Steve; Kendrick, Steve; June 24, 2008; 1 pp.; In English; SPIE Astronomical Telescope and Instrumentation 2008 Conference, 24-28 Jun. 2008, Marseilles, France; Copyright; Avail.: Other Sources; Abstract Only

Optical design concepts for the telescope and instrumentation for NASA's New Worlds Observer program are presented. First order parameters are derived from the science requirements, and estimated performance metrics are shown using optical models. A four meter multiple channel telescope is discussed, as well as a suite of science instrument concepts. Wide field instrumentation (imager and spectrograph) would be accommodated by a three-mirror anastigmat telescope design. Planet finding and characterization would use a separate channel which is picked off after the first two mirrors (primary and secondary). Guiding concepts are also discussed.

Author

Telescopes; Optical Properties; Functional Design Specifications; Design Analysis; Optical Equipment

20080030248 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Optical Performance Modeling for NASA's James Webb Space Telescope

Howard, Joseph M.; June 24, 2008; 1 pp.; In English; SPIE Astronomical Telescope and Instrumentation 2008 Conference, 24-28 Jun. 2008, Marseilles, France; No Copyright; Avail.: Other Sources; Abstract Only

Optical performance modeling for NASA's James Webb Space Telescope is discussed. Alignment drifts, line-of-sight image motion, wavefront sensing, and detector noise are considered in a single model environment for evaluating the predicted performance of the observatory. Parametric sensitivity analyses are performed, and examples presented.

Author

James Webb Space Telescope; Optical Properties; Optical Equipment; Sensitivity Analysis; Performance Tests

20080030249 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Automated SVD for Alignment and Control of James Webb Space Telescope Mirrors

Shiri, Sharam; Howard, Joseph M.; Aronstein, David L.; Ha, Kong; Smith, J. Scott; Dean, Bruce; June 24, 2008; 1 pp.; In English; SPIE Astronomical Telescope and Instrumentation Meeting, 24-28 Jun. 2008, Marseilles, France; No Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) is a three-mirror anastigmatic telescope. The alignment of the segmented primary and secondary mirrors in the wavefront sensing and control process involves a series of actuators to control the six degrees-of-freedom motion on each surface in addition to the radius of curvature. The control matrix developed from the alignment parameters is over-determined and singular value decomposition (SVD) method is used to solve it in the least square sense. An automated SVD scheme has been developed to identify the most contributing modes in a typical alignment process and reduce the impact of error-prone modes from the control process.

Author

James Webb Space Telescope; Control; Alignment; Algorithms; Segmented Mirrors

20080030277 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Physics of the Dayside Magnetosphere: New Results From a Hybrid Kinetic Code

Siebeck, D. G.; Omidi, N.; July 30, 2007; 1 pp.; In English; Asia Oceania Geosciences Society (AOGS) 2007 4th Annual Meeting, 30 Jul. - 4 Aug. 2007, Bangkok, Thailand; Copyright; Avail.: Other Sources; Abstract Only

We use a global hybrid code kinetic model to demonstrate how kinetic processes at the bow shock and within the foreshock can dramatically modify the solar wind just before its interaction with the magnetosphere. During periods of steady radial interplanetary magnetic field (IMF) orientation, the foreshock fills with a diffuse population of suprathermal ions. The ions generate cavities marked by enhanced temperatures, depressed densities, and diminished magnetic field strengths that convect antisunward into the bow shock with the solar wind flow. Tangential discontinuities marked by inward-pointing electric fields and normals transverse to the Sun-Earth line generate hot flow anomalies marked by hot tenuous plasmas bounded by outward propagating shocks. When the motional electric field in the magnetosheath points inward towards the Earth, a solitary bow shock appears. For typical IMF orientations, the solitary shocks should appear at poorly sampled high latitudes, but for strongly northward or southward IMF orientations the solitary shocks should appear on the flanks of the magnetosphere. Although quasi-perpendicular, solitary shocks should be marked by turbulent magnetosheath flows, often directed towards the Sun-Earth line, and abrupt spike-like enhancements in the density and magnetic field strength at the

shock. Finally,we show how flux transfer events generated between parallel subsolar reconnection lines are destroyed upon encountering the magnetopause at latitudes above the cusp.
Author
Kinetics; Shock Waves; Solar Wind; Magnetospheres; Plasma Physics

20080030641 Naval Research Lab., Washington, DC USA
A New Model of Graph and Visualization Usage
Trafton, J G; Trickett, Susan B; Jan 2001; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 55-7850-00
Report No.(s): AD-A480181; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We propose that current models of graph comprehension do not adequately capture how people use graphs and complex visualizations. To investigate this hypothesis, we examined 3 sessions of scientists using an in vivo methodology. We found that in order to obtain information from their graphs, scientists not only read off information directly from their visualizations (as current theories predict), but they also used a great deal of mental imagery 'which we call spatial transformations'. We propose an extension to the current model of visualization comprehension and usage to account for this data.
DTIC
In Vivo Methods and Tests; Vision

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20080029299 Maryland Univ., College Park, MD, USA
Computational Center for Studies of Microturbulence. Final Report
January 2006; 3 pp.; In English
Report No.(s): DE2007-894267; No Copyright; Avail.: Department of Energy Information Bridge

The Maryland Computational Center for Studies of Microturbulence (CCSM) was one component of a larger, multi-institutional Plasma Microturbulence Project, funded through what eventually became DOE's Scientific Discovery Through Advanced Computing Program. The primary focus of research in CCSM was to develop, deploy, maintain, and utilize kinetic simulation techniques, especially the gyrokinetic code called GS2.
NTIS
Plasma Dynamics; Turbulence

20080030286 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Flare Plasma Iron Abundance
Dennis, Brian R.; Dan, Chau; Jain, Rajmal; Schwartz, Richard A.; Tolbert, Anne K.; May 26, 2008; 1 pp.; In English; AGU meeting for the special session of the Solar Physics Division of the American Astronomical Society, 26-31 May 2008, Fort Lauderdale, FL, USA; Copyright; Avail.: Other Sources; Abstract Only

The equivalent width of the iron-line complex at 6.7 keV seen in flare X-ray spectra suggests that the iron abundance of the hottest plasma at temperatures >approx.10 MK may sometimes be significantly lower than the nominal coronal abundance of four times the photospheric value that is commonly assumed. This conclusion is based on X-ray spectral observations of several flares seen in common with the Ramaty High Energy Solar Spectroscopic Imager (RHESSI) and the Solar X-ray Spectrometer (SOXS) on the second Indian geostationary satellite, GSAT-2. The implications of this will be discussed as it relates to the origin of the hot flare plasma - either plasma already in the corona that is directly heated during the flare energy release process or chromospheric plasma that is heated by flare-accelerated particles and driven up into the corona. Other possible explanations of lower-than-expected equivalent widths of the iron-line complex will also be discussed.
Author
Plasma Temperature; X Ray Spectrometers; Plasmas (Physics); Geosynchronous Orbits; High Temperature Plasmas; Photosphere; Solar X-Rays

20080030361 NASA Goddard Space Flight Center, Greenbelt, MD, USA

First Results of PIC Modeling of Kinetic Alfven Wave Dissipation

Chulaki, Anna; Hesse, Michael; Zenitani, Seiji; December 09, 2007; 1 pp.; In English; 2007 AGU Fall Meeting, 9-14 Dec. 2007, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present first results of an investigation of the kinetic damping of Alfven wave turbulence. The methodology is based on a fully electromagnetic, three-dimensional, particle in cell code. The calculation is initialized by an Alfven wave spectrum. Subsequently, a cascade develops, and damping by coupling to both ions and electrons is observed. We discuss results of these calculations, and present first estimates of damping rates and of the effects of energy transfer on ion and electron distributions. The results pertain to solar wind heating and acceleration.

Author

Kinetics; Damping; Magnetohydrodynamic Waves; Magnetohydrodynamic Turbulence; Particle In Cell Technique

20080030362 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Dissipation in Relativistic Pair-Plasma Reconnection

Hesse, Michael; Zenitani, Seiji; December 09, 2007; 1 pp.; In English; 2007 AGU Fall Meeting, 9-12 Dec. 2007, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present an investigation of the relativistic dissipation in magnetic reconnection. The investigated system consists of an electron-positron plasma. A relativistic generalization of Ohm's law is derived. We analyze a set of numerical simulations, composed of runs with and without guide magnetic field, and of runs with different species temperatures. The calculations indicate that the thermal inertia-based dissipation process survives in relativistic plasmas. For anti-parallel reconnection, it is found that the pressure tensor divergence remains the sole contributor to the reconnection electric field, whereas relativistic guide field reconnection exhibits a similarly important role of the bulk inertia terms.

Author

Magnetic Field Reconnection; Relativistic Plasmas; Dissipation; Electron-Positron Plasmas

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*.

20080026295 NASA Langley Research Center, Hampton, VA, USA

Energy Levels and Intensity Parameters of Ho3(+) Ions in Y3Al5O12 and Lu3Al5O12

Walsh, Brian M.; Grew, Gary W.; Barnes, Norman P.; January 2006; 33 pp.; In English; Original contains poor quality, truncated or crooked pages

Contract(s)/Grant(s): 423799.07.01; Copyright; Avail.: CASI: A03, Hardcopy

The energy levels of the trivalent lanthanide Ho(sup 3+) in Y3Al5O12 (YAG) and Lu3Al5O12 (LuAG) have been measured. The Stark split levels for the first nine Ho manifolds in these materials have been measured, and the results have been fit to a free ion plus crystal field Hamiltonian to generate a theoretical set of energy levels. Crystal field parameters were varied to determine the best fit between experimental and theoretical energy levels. The energy levels of Ho:LuAG are seen to be very similar to those in Ho:YAG. However, subtle changes resulting from replacing Y(sup 3+) with Lu(sup 3+) in the garnet crystal Y3Al5O12 result in different transition wavelengths in LuAG. This has implications for Ho (sup 5)I7yields (sup 5)I8 lasers operating at approximately 2.1 micrometers. Although the energy levels have been measured previously in Ho:YAG, they have not been measured in Ho:LuAG. A comparison of the energy levels in Ho:YAG measured here show some discrepancies with previous measurements. The consistency of the energy level placement between Ho:LuAG and Ho:YAG indicate that the earlier studies may have some errors in the assignments. Finally, a Judd-Ofelt analysis is performed on Ho:YAG and Ho:LuAG to determine the intensity parameters, and thus, the transition probabilities and branching ratios of the first eight excited manifolds.

Author

Energy Levels; Doped Crystals; Ions; Lasers; Optical Materials; Luminous Intensity

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20080030469 Naval Postgraduate School, Monterey, CA USA
Determination of Vertical Thermal Structure from Sea Surface Temperature
Chu, Peter C; Fan, Chenwu; Liu, W T; Jul 2000; 10 pp.; In English
Report No.(s): AD-A479868; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479868

A recently developed parametric model by P. C. Chu et al. is used in this paper for determining subsurface thermal structure from satellite sea surface temperature observations. Based on a layered structure of temperature fields (mixed layer, thermocline, and lower layers), the parametric model transforms a vertical profile into several parameters: sea surface temperature (SST), mixed layer depth (MLD), thermocline bottom depth (TBD), thermocline temperature gradient (TTG), and deep layer stratification (DLS). These parameters vary on different timescales: SST and MLD on scales of minutes to hours, TBD and TTG on months to seasons, and DLS on an even longer timescale. If the long timescale parameters such as TBD, TTD, and DLS are known (or given by climatological values), the degree of freedom of a vertical profile fitted by the model reduces to one: SST. When SST is observed, one may invert MLD, and, in turn, the vertical temperature profile with the known long timescale parameters: TBD, TTG, and DLS. The U.S. Navy's Master Oceanographic Observation Data Set (MOODS) for the South China Sea in May 1932-94 (10 153 profiles) was used for the study. Among them, there are 40 data points collocating and coappearing (same week) with the weekly daytime NASA multichannel SST data in 1986-94. The 40 MOODS profiles were treated as a test dataset. The MOODS dataset excluding the test data is the training dataset, consisting of 10 113 profiles. The training dataset was processed into a dataset consisting of SST, MLD, TBD, TTG, and DLS using the parametric model. SST from the test dataset was used for the inversion based on the known information on TBD, TTG, and DLS. The 40 inverted profiles agreed quite well with the corresponding observed profiles.
DTIC
Sea Surface Temperature; Surface Temperature; Temperature Distribution; Thermodynamic Properties; Vertical Distribution

20080030644 Naval Postgraduate School, Monterey, CA USA
Comment on A Coupled Dynamic-Thermodynamic Model of an Ice-Ocean System in the Marginal Ice Zone
Chu, P C; Garwood, Jr, Ronald W; Nov 1987; 3 pp.; In English
Report No.(s): AD-A480186; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The recent article by Hakkinen [1987] creatively addresses a number of important dynamic and thermodynamic processes in the marginal ice zone (MIZ). We believe that her study will stimulate further research on the coupled ice-ocean system. For now we would like to offer the following discussion of the need to augment the entrainment equation to include surface buoyancy flux for general application to the MIZ.
DTIC
Dynamic Models; Ice; Ice Environments; Sea Ice; Thermodynamics

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*.

20080029398 NASA Johnson Space Center, Houston, TX, USA
Space Exploration
Davis, Jeffrey R.; March 29, 2006; 1 pp.; In English; Space Exploration, 29 Mar. 2006, Fresno, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

This abstract covers a one hour presentation on Space Exploration. The audience is elementary students; therefore there are few words on the slides, mostly pictures of living and working in space. The presentation opens with a few slides describing a day in the life of a space explorer. It begins with a launch, discussions of day-night cycles, eating, exercising, housekeeping, EVA, relaxation, and sleeping. The next section of the presentation shows photos of astronauts performing experiments on the ISS. Yokomi Elementary School launched this fall with the most advanced educational technology tools

available in schools today. The science and technology magnet school is equipped with interactive white boards, digital projectors, integrated sound systems and several computers for use by teachers and students. The only elementary school in Fresno Unified with a science focus also houses dedicated science classrooms equipped specifically for elementary students to experience hands-on science instruction in addition to the regular elementary curriculum.
Author
Space Exploration; Aerospace Sciences; Education

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080029252 Schafer Corp., Huntsville, AL, USA
The Ares Projects Office: Building an Exploration Culture from the Inside Up
Leahy, Bartholomew; April 17, 2008; 1 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNM07AA70C; No Copyright; Avail.: Other Sources; Abstract Only

NASA is building its first new human-rated space exploration vehicles in nearly 40 years. This marks an important operational and cultural change from the Space Shuttle. In the wake of the Columbia disaster, the agency and the nation realized that NASA's goals and culture needed to change. The Ares Projects Office (APO), which is building the launch vehicles that will power human beings to the Moon, Mars, and beyond, is taking a page from the Saturn playbook by having NASA lead both the overall integration and the development of the Ares I upper stage. APO is also creating a new culture of cooperation, openness, and informed risk taking as we set our sights on other worlds. APO has established a team environment where issues can be discussed, information is shared, fun and teamwork are encouraged, and constructive conflict and accountability are expected. Following a 'One NASA' philosophy, APO is taking steps to strengthen cooperation among space centers, contractor partners, engineering and scientific communities, and headquarters personnel. As we learn lessons from things that Went wrong with the Space Shuttle, we are also borrowing best practices from what has gone right with that program and others. All of these cultural elements will be necessary as we take the next steps beyond Earth orbit.
Author
Launch Vehicles; NASA Programs; Personnel; Organizing; Project Management

20080029983 NASA Johnson Space Center, Houston, TX, USA
Risk Management in EVA
Hall, Jonathan; Lutomski, M.; April 07, 2006; 16 pp.; In English; Class: Managing Projects and Processes, 7 Apr. 2006, Austin, TX, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080029983

This viewgraph presentation reviews the use of risk management in Extravehicular Activities (EVA). The contents include: 1) EVA Office at NASA - JSC; 2) EVA Project Risk Management: Why and When; 3) EVA Office Risk Management: How; 4) Criteria for Closing a Risk; 5) Criteria for Accepting a Risk; 6) ISS IRMA Reference Card Data Entry Requirements; 7) XA/ EVA Office Risk Activity Summary; 8) EVA Significant Change Summary; 9) Integrated Risk Management Application (XA) Matrix, March 31, 2004; 10) ISS Watch Item: 50XX Summary Report; and 11) EVA Project RM Usefulness
CASI
Extravehicular Activity; Risk Management; International Space Station; Project Management

20080030091 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA's Computer Database Program for System Safety Risk Management Oversight
Johnson, Paul W.; April 23, 2008; 10 pp.; In English; International System Safety Regional Conference 2008, 21-23 Apr. 2008, Singapore; Original contains black and white illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030091

ePORT (electronic Project Online Risk Tool) provides a systematic approach to using an electronic database program to manage a program/project risk management processes. This presentation will briefly cover the standard risk management procedures, then thoroughly cover NASA's Risk Management tool called ePORT. This electronic Project Online Risk Tool (ePORT) is a web-based risk management program that provides a common framework to capture and manage risks, independent of a programs/projects size and budget. It is used to thoroughly cover the risk management paradigm providing

standardized evaluation criterion for common management reporting, ePORT improves Product Line, Center and Corporate Management insight, simplifies program/project manager reporting, and maintains an archive of data for historical reference. Author
Data Bases; Management Methods; Project Management; Risk Management; Systems Engineering

20080030963 NASA Johnson Space Center, Houston, TX, USA
A Formula for Fixing Troubled Projects: The Scientific Method Meets Leadership
Wagner, Sandra; March 21, 2006; 23 pp.; In English; Project Management Challenge, 21-22 Mar. 2006, Galveston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030963

This presentation focuses on project management, specifically addressing project issues using the scientific method of problem-solving. Two sample projects where this methodology has been applied are provided.
Derived from text
Project Management; Problem Solving; Leadership

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*.

20080026308 Bureau of the Census, Washington, DC, USA
New Uses of Health and Pension Information: The 5500 File at the Census Bureau
Lane, J. I.; Jan. 2002; 8 pp.; In English
Report No.(s): PB2007-113234; TP-2002-03; No Copyright; Avail.: CASI: A02, Hardcopy

The accurate measurement of employer-provided health and pension plan coverage is critically important for policy makers seeking to make state, local and national decisions that will affect the wellbeing of the current and future infirm and elderly population. However, current information could be vastly improved by improving estimates of coverage and by bettering the firm level information currently available. We propose to exploit an underutilized resource the 5500 file to achieve this improvement. The 5500 file, which contains data from annual returns filed annually with the Internal Revenue Service by all employers covered by ERISA, provides information on employee benefit plans, including data on different types of pension and health insurance plans.
NTIS
Census; Health; Income; Personnel; Retirement

20080029214 Defense Technical Information Center, Fort Belvoir, VA USA
Current Searching Methodology and Retrieval Issues: An Assessment
Randall, Carl S; Mar 2008; 235 pp.; In English
Report No.(s): AD-A478274; DTIC-E-TR-2008/05; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA478274

The study examined the current state of searching and the preferred method as indicated by the participants. Their views were analyzed and present in several categories. They are: preferred method of searching; status of searching methodology and its future; search systems' performances and the ability to effectively measure these systems; improvements needed in search systems; future role of catalogers and indexers; and searching in the future.
DTIC
Information Retrieval; Search Profiles

20080029328 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Machine Shop Information Model Application, Next Step
Lee, Y. T.; Luo, Y.; January 2007; 8 pp.; In English
Report No.(s): PB2007-112715; NISTIR-7388; No Copyright; Avail.: CASI: A02, Hardcopy

Simulation is defined as the imitation of the operation of a system or real-world process over time, and in many cases, manufacturing provides one of the most important applications of simulation. Standard interfaces could make information effective sharing, and hence promote the utilization of simulators. An information model, which represents machine shop data

and facilitates data sharing among machine shop's manufacturing execution system, scheduling system, and simulation system, has been developed at the National Institute of Standards and Technology (NIST). Recently NIST researchers in collaboration with industrial partners have been working on a standards development effort titled Core Manufacturing Simulation Data (CMSD) Product Development Group (PDG) under the guidelines, policies and procedures of the Simulation Interoperability Standards Organization (SISO). A key activity of the CMSD PDG is to develop a CMSD information model using the machine shop information model as the strawman. This paper briefs the machine shop information model and the CMSD information model. This paper discusses information exchange, using NIST's information model, between different representations and presents an algorithm to exchange data between a database system and an eXtensible Markup Language (XML) document. The algorithm has been built based on Document Object Model (DOM), XML Path Language (XPath), and Open Database Connectivity Database Engine (ODBC).
NTIS
Information Systems; Shops

20080029329 National Inst. of Standards and Technology, Gaithersburg, MD USA
Architecture Development Facilitator (ADF), First Year Report
Fenves, S. J.; Subrahmanian, E.; Goyal, P.; Angbo, J. C.; Daoud, F.; Mar. 2007; 52 pp.; In English
Report No.(s): PB2007-112714; NISTIR-7411; No Copyright; Avail.: CASI: A04, Hardcopy

This document serves as the summary report on the first year's progress on the Architecture Development Facilitator (ADF) project covering the activities from December 15, 2005, to December 15, 2006. The ADF is intended to assist the Office of Network Coordinator for Health Information Technology (ONC) of the Department of Health and Human Services (HHS) and its agents in the deployment of the Nationwide Health Information Network (NHIN). ADF will serve as the repository of a set of predefined compatible health care IT components, called artifacts, which can then be combined to design, configure and deploy a large variety of health care IT system architectures. The design of ADF responds to the evolving nature of the NHIN by making absolutely no assumptions about the upper levels of the NHIN architecture and by not imposing any constraints on the architecture. An artifact is defined in ADF as either: (a) a service or system component of NHIN (service artifact) or (b) a unit of information interchanged between service artifacts (information unit artifact). Artifacts are represented in the ADF by a generic template applicable to all artifact types, type-specific template extensions for each type, and by the relationships between the artifacts.
NTIS
Architecture (Computers); Computer Networks; Health

20080030126 Department of Health and Human Services, Washington, DC USA
Summary of the NHIN (Nationwide Health Information Network) Prototype Architecture Contracts
May 31, 2007; 113 pp.; In English
Report No.(s): PB2007-112998; No Copyright; Avail.: National Technical Information Service (NTIS)

These contracts each validated important basic principles that underlie the current approach to the NHIN. These principles include: The possibility of operating the NHIN as a network of networks without a central database or services; The criticality of common standards for developing the NHIN, particularly in the way that component exchanges interact with each other; Synergies and important capabilities can be achieved by supporting consumers and healthcare providers on the same infrastructure; Consumer controls can be implemented to manage how a consumers information is shared on the network; There can be benefits from an evolutionary approach that does not dictate wholesale replacement or modification of existing healthcare information systems. The substantive commonalities of the approaches can be coalesced into the go-forward approach that supports the next steps in building an NHIN that supports the U.S. Health IT Agenda. The contractors delivered reports throughout 2006 describing functional requirements of the NHIN, security models, areas for needed standards, an overall architecture, and business models. The prototype architecture projects culminated with live demonstrations at the NHIN Prototype Architecture Project Third NHIN Stakeholder Forum on 2526 January 2007. This report is a synthesis of their approaches as a basis for the next steps in creating the NHIN.
NTIS
Computer Networks; Health; Information Systems; Prototypes

20080030133 Rule of Law Foundation, Unknown
Building the Rule of Law Information Network Infrastructure in Moldova
Jan. 30, 2002; 16 pp.; In English
Contract(s)/Grant(s): NCJRS-99-IJ-CX-0063
Report No.(s): PB2007-113137; No Copyright; Avail.: CASI: A03, Hardcopy

The main deliverable for the project was to install Internet studios at 10 organizations connected with criminal justice in Moldova, with at least five computer workstations each, an NT server, network equipment, a printer, high-speed dedicated access to the Internet, technical support, and training. In addition, an Inter-Agency Training Center with 10 workstations would be the site for training personnel from the ten organizations hosting studios on the use of the Internet. These studios formed the basis for content development activities outside the scope of this project, but covered in grant 1999-IJ-CX-0065. These activities included developing Web sites describing the host institutions structures, missions, policies, activities, and public outreach; creating collections of legal materials, official government documents, statistics and other non-classified information and making them available for public access through the Internet; and providing training on general Internet use and publishing.
NTIS
Internets; Moldova

20080030203 Battelle Team, Columbus, OH, USA; Texas A&M Univ., College Station, TX USA
Quality Control Procedures for Achived Operations Traffic Data: Synthesis of Practice and Recommendations
Turner, S.; Mar. 2007; 44 pp.; In English
Contract(s)/Grant(s): DTFH61-97-C-00010
Report No.(s): PB2007-113178; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes and provides recommendations for quality control procedures to be used for archived data that have been collected and saved by traffic operations systems. This report summarizes quality control procedures used in numerous archived data management systems (ADMS) implementations. This report provides recommendations for a basic set of quality control procedures that can be adopted, as well as a process to customize quality control procedures for system-specific data quality issues. This report also details the typical steps involved in quality control procedures, including the automation of quality checks, the use of manual visual review, the flagging of failed data records, and the use of metadata to document quality control actions. The intended audience for this report includes developers of ADMS as well as researchers and analysts of archived data. Software developers can adapt some or all of the quality control procedures as deemed necessary. The report could also be used or specified in writing a request for proposals to develop an ADMS. Researchers and data analysts can use the report to perform additional quality control if data quality remains an issue.
NTIS
Data Management; Management Systems; Quality Control; Traffic

20080030390 Naval Postgraduate School, Monterey, CA USA
The Role of Framing in Counterinsurgency/Counterterrorism Operations: The Status of Hearts and Minds
Anderson, Todd A; Mar 2008; 87 pp.; In English
Report No.(s): AD-A479662; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479662

Public diplomacy - winning hearts and minds - is increasingly being recognized as integral to the fight against terrorism. Yet we know little about terrorist framing of their operations and its appeal. Is there a pattern in terrorist narratives that can be identified and countered? This thesis will examine how terrorist and insurgent movements frame their actions, delineating how these groups communicate with their public. Framing offers insights into terrorist and insurgent operations that are only recently being addressed but still not widely capitalized on by current U.S. Army operations in Iraq. My focus is on the role of framing in the U.S. counterterrorism effort, and I will demonstrate how insurgent and terrorist messages shape the information operations (IO) battlefield against U.S. and Coalition Forces in the Middle East. The thesis will show that the terrorist's message is just as important as the act of terrorism itself and these messages provide a window into understanding their operations, their ties to constituencies, and possibly their direction for future attacks. The concept of framing can serve as an aid to U.S. military leaders in addressing problems that the conventional forces face when tasked to fight an unconventional but highly organized enemy. Framing's application to military operations could help to better define the IO and PSYOP operations to maneuver commanders who are not as well versed in the use of non-kinetic offensive and defensive operations. Framing, as defined by social mobilization theorists offers a different perspective on the operational structure of

insurgent leadership and can demonstrate weaknesses in the insurgent organization that can be capitalized upon with less threat to civilian life.
DTIC
Heart; Warfare

20080030413 Army War Coll., Carlisle Barracks, PA USA
Inefficient Battle Command Results From Unique Commanders Solutions
Wortman, Carol A; Mar 3, 2008; 33 pp.; In English
Report No.(s): AD-A479737; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479737

The purpose of this paper is to assess the strategic impacts of unit procured Information Technology (IT) in support of Battle Command (BC) and assess the Army major acquisition programs ability to support urgent warfighter needs. Today's selection and use of BC systems is a highly competitive process and extremely leader centric. Unit commanders and their staff outside of the Army's acquisition process, expend unit funds to purchase or create BC systems that meet their specialize approach to BC. Training and information is not available to commanders that describe the impacts of pursuing their own. BC solutions to meet individual preferences Army acquisition programs are at a competitive disadvantage in meeting urgent warfighter needs and therefore users circumvent the system rather than use it. The result is duplicative and inconsistent unit solutions that reduce the effectiveness of BC and the efficiency of resources. Unity of effort is needed to balance warfighter innovation manage the impact of these innovations and the ability to incorporate successful innovations into army acquisition programs for long term sustainment.
DTIC
Acquisition; Government Procurement; Information Systems

20080030421 Army War Coll., Carlisle Barracks, PA USA
Cyberspace Domain: A Warfighting Substantiated Operational Environment Imperative
Kelley, Olen L; Mar 25, 2008; 37 pp.; In English
Report No.(s): AD-A479775; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479775

In 2001, Joint Publication (JP) 3-0 identified five warfighting domains. The document contained the commonly accepted four operational environments, but added a new domain: 'information.' This landmark inclusion started an intense debate within the Joint community. Previous clarity on the commonly accepted operational environment's roles and functions became blurred. Those who advocated information as a warfighting domain advanced its common understanding, yet could not reach doctrinal consensus. Discussions about how to describe, organize, and use the USA' information capabilities to support the Department of Defense's (DoD) strategic and operational objectives and national security goals remain contentious and ambiguous. This inability to develop consensus led to the re-characterization of information in the current JP 3-0, 'Joint Operations,' from a warfighting domain to an 'environment.' However, this change did not resolve the fundamental issue and the information domain debate continues unabated. The recently published 'National Military Strategy for Cyberspace Operations' (NMS-CO) again officially codified its understanding of 'information,' now defined as cyberspace, as a warfighting domain. It acknowledges the JP 3-0 information domain change to environment, but emphasizes that 'treating cyberspace as a domain establishes a foundation to understand and define its place in military operations.' The DoD has expended considerable effort in a 'piece meal' strategy that updates information-related doctrine based on new technology instead of developing a comprehensive cyberspace strategy. This paper argues that a clear consensus is needed to establish a 'cyberspace domain' where JFCs conduct war 'as an act of force to compel our enemy to do our will.' Advancing the proposed NMS-CO's cyberspace domain definition clarifies information operation's roles and functions, thereby enabling information superiority.
DTIC
Defense Program; Military Operations; Strategy; Warfare

20080030449 Virginia Univ., Charlottesville, VA USA
Fault Tolerance in Critical Information Systems
Elder, Matthew C; May 2001; 239 pp.; In English
Contract(s)/Grant(s): F30602-96-1-0314; F30602-99-1-0538
Report No.(s): AD-A479834; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479834

Critical infrastructure applications provide services upon which society depends heavily, such applications require

constant, dependable operation in the face of various failures, natural disasters, and other disruptive events that might cause a loss of service. These applications are themselves dependent on distributed information systems for all aspects of their operation, so survivability of these critical information systems is an important issue. Survivability is the ability of a system to continue to provide service, though possibly alternate or degraded, in the face of various types of failure and disruption. A fundamental mechanism by which survivability can be achieved in critical information systems is fault tolerance. Much of the literature on fault-tolerant distributed systems focuses on tolerance of local faults by detecting and masking the effects of those faults. I describe a direction for fault tolerance in the face of non-local faults faults whose effects have significant non-local impact, sometimes widespread and sometimes catastrophic where often the effects of these faults cannot be masked using available resources. The goal is to recognize these non-local faults through detection and analysis, then to provide continued service (possibly alternate or degraded) by reconfiguring the system in response to these faults.
DTIC
Fault Tolerance; Information Systems

20080030452 Virginia Univ., Charlottesville, VA USA
Policy Specification for Non-Local Fault Tolerance in Large Distributed Information Systems
Varner, Philip E; May 2003; 91 pp.; In English
Contract(s)/Grant(s): F30602-01-1-0503
Report No.(s): AD-A479837; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479837

The services provided by critical infrastructure systems are essential to the operation of modem society. These systems include the financial payments system, transportation systems, military command and control systems, the electric power grid, and telecommunications systems including the Internet. Widespread failure of any of these system might result in severe financial loss or perhaps human injury. Critical infrastructure systems rely heavily on distributed information systems for operation. These information systems must therefore be dependable; that is, they must 'deliver service that can justifiably be trusted.' Traditional dependability alone does not provide a rich enough model to deal with the faults in large, critical distributed systems operating in hostile environments. These systems require not simply dependability but instead require survivability. Informally, survivability is when a system has 'the ability to continue to provide service (possibly degraded or different) in a given environment when various events cause major damage to the system or its operating environment.' One means of achieving survivability is non-local fault tolerance, where faults that affect significant portions of the network must be detected and handled in a coordinated fashion. Our approach to doing this is with a survivability control system. This control system takes network sensor events as input, uses these to detect faults, and responds with application reconfiguration. This thesis presents TEDL, the Time-based Event Detection Language, for formal specification of the reactive policy of this control system. A translator is used to synthesize an executable implementation from this specification. The results from using TEDL to describe and execute several attack and failure scenarios for a simplified financial payments system are presented.
DTIC
Fault Tolerance; Information Systems; Policies

20080030454 Naval Postgraduate School, Monterey, CA USA
Mitigating Information Overload: The Impact of 'Context-Based Approach' to the Design of Tools for Intelligence Analysts
Brueggemann, Charles E; Mar 2008; 130 pp.; In English
Report No.(s): AD-A479839; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479839

With the explosion of available data from a variety of sources, it has become increasingly difficult for intelligence analysts and others to keep pace with the amount of arriving data, to extract actionable information from it, and to integrate that information with prior knowledge. Add to that the pressures of today's fusion center climate and it becomes clear that analysts, police officers, and executives' ability to make rapid, sound decisions is severely compromised. The combination of circular reporting and the complexity of data sources are contributing to information overload. Law enforcement agencies realize this cannot be resolved by continuing to hire more intelligence analysts. Instead, they must begin leveraging technology. The Illinois State Police department is utilizing a technology artifact in its Statewide Terrorism and Intelligence Center (STIC) that incorporates technology built from the context of these users. This thesis uses a survey instrument to evaluate the effectiveness

of this technology on reducing circular reporting and easing the handling of complex data sources. The findings show that intelligence analysts within STIC perceive that information overload exists, and both the complexity of data sources and circular reporting minimize their effectiveness and efficiency. The technology described here mitigates these negative effects and increases the Illinois STIC's ability to better serve communities.
DTIC
Context; Data Processing; Information Management; Intelligence; Multisensor Fusion

20080030464 National Defense Univ., Washington, DC USA
The Defense Readiness Reporting System: A New Tool for Force Management
Junor, Laura J; Jan 2005; 5 pp.; In English
Report No.(s): AD-A479857; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479857

In the spring of 2002, the Office of the Secretary of Defense formally announced plans to create the Defense Readiness Reporting System (DRRS), with the promise that it would promote a real change in how DoD thinks about, plans for, and assesses the ability of the Armed Forces to conduct operations. Today, the system is evolving to meet the need of force providers such as U.S. Joint Forces Command (JFCOM) to identify units that have, or can quickly develop, the capabilities requested by theater commanders. The DRRS is designed to track detailed information on what forces, and even individuals, can do on a near-real-time basis. When complete, DRRS will be a network of applications that provides force managers at all levels the tools and information to respond to emerging crises and the ability to assess the risks of conducting such operations. The DRRS is a major transformation, moving the focus of force managers from reporting unit readiness to managing force capabilities. Specifically, it represents a shift from resources to capabilities -- inputs to outputs, deficiencies to their implications, units to combined forces, front-line units to all units contributing to front-line operations. The detailed information on what individuals and organizations can do -- from capability entities up to combatant commanders -- resides in the Enhanced Status of Resources and Training System (ESORTS). ESORTS is a secure, Web-based information system describing the status of organizations that contribute to the warfighting system. It is built around explicit measures of performance relative to assigned standards, resources, and force sustainment.
DTIC
Combat; Education; Information Systems; Maintainability; Manpower; Organizations; Resources

20080030488 Naval Postgraduate School, Monterey, CA USA
Reducing the Threat of Terrorism through Knowledge Sharing in a Virtual Environment Between Law Enforcement and the Private Security Industry
Gallagher, Jerry P; Mar 2008; 97 pp.; In English
Report No.(s): AD-A479924; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479924

Each day approximately 6,800 members of the private security workforce are deployed across Kansas City to provide protection services at venues, many of which have been identified as being critical infrastructure and/or key resources. While these guards are tasked with providing the first line of defense at these locations, there is currently no mechanism or protocol in place to facilitate a timely exchange of threat information between private security and the KCPD. To empower this resource as a terrorism prevention force multiplier the development of a web based virtual knowledge sharing initiative was explored in this study as a solution to provide 'one stop shopping' for consumers of homeland security related needs from the private security industry. The factors measured in this study indicate that private security leaders perceived significant value in the proposed initiative and that the current environment is one that would favor success. One factor that supports this finding was the strong positive bias displayed to the 'trust' factor, which was identified in this research as the lubricant of exchange relationships. While leaders did not demonstrate a high level of concern regarding the threat of a local terrorist act occurring in the next five years, the sharing of threat information did indicate that complacency could be reduced and the level of interest/value of participating be increased through the sharing of threat knowledge. Industry leaders also clearly indicated a universal belief that private security should have a role in the mission of countering critical infrastructure.
DTIC
Law (Jurisprudence); Personnel; Security; Terrorism

20080030490 Naval Postgraduate School, Monterey, CA USA

The Integration of Decision Support Technologies to Support Consistent Government Evaluation of Contract Proposals

Garrison, Roy M; Mar 2008; 95 pp.; In English

Report No.(s): AD-A479927; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA479927

Within federal government contracting, contracting officers are empowered to evaluate proposals and determination which contractor should be awarded the contract. With multiple variables to consider, managing tradeoffs is an important aspect of the evaluation process. As such, there is room for a large amount of subjectivity in the evaluation process. Since multiple contracting officers can arrive at different conclusions when evaluating the same proposals, there are instances when the wrong contractor is awarded a contract, as only one contractor can offer the true best value. Thus, the subjectivity in the process needs to be reduced so the contractor offering the best value is awarded the contract a higher percentage of the time. This thesis examines how the application of existing decision support technologies can assist contracting personnel in determining which proposal offers the best value to the government. The intent is to establish a model that, when implemented, will ensure contracting officers evaluate proposals both consistently and fairly. The proposed system integrates several decision support technologies. The overall concept is designed using a weight-based ranking model, enabled by a multi-criteria decision analysis software system. Supporting decision support software packages include an expert system and a data warehouse.

DTIC

Acquisition; Contracts; Decision Support Systems; United States

20080030567 Naval Postgraduate School, Monterey, CA USA

Frequency Mapping for the Operational Frequency Manager

Walker, Scott A; Luna, Lauro; Mar 2008; 141 pp.; In English

Report No.(s): AD-A479958; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) has placed great emphasis on the networking and connectivity of forces over the last several years. Programs include the Global Information Grid (GIG), Force Net, and Net Centric Warfare to name a few. These programs emphasize and stress the warfighter's need to stay connected to their appropriate operational command and control structure during operations. The value of this connectivity is crucial to both the individual warfighter and the command structure as a force multiplier in modern warfare. One solution to this problem of connectivity is giving our operating forces the tools and knowledge of existing network infrastructure that details the information regarding the location, frequency and power out of existing nodes and spectrum analysis. The knowledge and ability of a trained Frequency Manager will allow our forces to use the full electromagnetic spectrum to maintain connectivity with their command structure. The goal of this research is to provide a systematic approach to detecting existing network and telecommunication frequencies and mapping their positions. This information can then used by a Frequency Manager for planning operational test exercises and for operational forces that may operate in an area that is frequency saturated. In these situations and with the knowledge of existing frequencies these forces will be better able to manage, configure, and exploit existing network communications. The experimental study will encompass the collection, data processing, modeling and mapping of existing networks and their electromagnetic effects in both a rural and urban environment using the TNT 802.16 OFDM test bed in the San Francisco Bay area and Camp Roberts.

DTIC

Frequencies; Mapping

20080030588 Naval Undersea Warfare Center, Newport, RI USA

Comparative Cognitive Task Analysis

Kirschenbaum, Susan S; Trafton, J G; Pratt, Elizabeth; Jan 2007; 11 pp.; In English

Contract(s)/Grant(s): N00014-00-WX-20844; N00014-00-WX-40002; Proj-A424102

Report No.(s): AD-A480014; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It is easy to force a weather forecaster to work out of context -- simply move him or her to some new locale. Effects of ocean currents, seasonal variations, and effects of land masses change everything. Any knowledge of trends that the forecaster had relied on are now utterly useless. The information that the weather forecaster uses is often downloaded from external Web sites. Local weather organizations use (or build) support tools for displaying downloaded data and images and for building and displaying their own forecasts. To optimize these tools, consideration must be given to the user-tooltask triad that is central to the principles of human-centered computing (HCC). The traditional way human factors engineers approach this problem is to perform a task analyses to determine how people operate in a specific domain on a specific task. Cognitive Task Analysis

(CTA) is a set of methods that takes into account the perception (i.e., vision), cognition (i.e., decision making), and motor actions (i.e., mouse movements) needed to accomplish a task. In this chapter, we build on CTA methods by suggesting that comparative cognitive task analysis (C2TA) can help solve the aforementioned problems. C2TA is based on replication studies conducted in different environments. Because it derives data from more than one environment, C2TA provides insight into interface design that single-site studies and individual CTA methods cannot.
DTIC
Cognition; Data Processing; Mental Performance; Tasks

20080030632 Library of Congress, Washington, DC USA
Al Qaeda: Statements and Evolving Ideology
Blanchard, Christopher M; Jun 20, 2005; 17 pp.; In English
Report No.(s): AD-A480146; CRS-RL32759; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Osama Bin Laden and the Al Qaeda terrorist network have conducted a sophisticated public relations and media campaign over the last 10 years. Terrorism analysts believe that these messages have been designed to elicit psychological reactions and communicate complex political messages to a global audience as well as to specific populations in the Islamic world, the USA, Europe, and Asia. Some officials and analysts believe that Al Qaeda's messages contain signals that inform and instruct operatives to prepare for and carry out new attacks. Bin Laden has referred to his public statements as important primary sources for parties seeking to understand Al Qaeda's ideology and political demands. Global counterterrorism operations in the aftermath of the September 11, 2001 terrorist attacks appear to have limited Bin Laden's ability to provide command and control leadership to Al Qaeda operatives and affiliated groups. However, he and other Al Qaeda leaders continue to release statements that sanction, encourage, and provide guidance for future terrorist operations. Iraq, in particular, has become a focal point for Al Qaeda's rhetoric, as recent statements have underscored Al Qaeda's interest in Iraq and support for the ongoing insurgency there. This report reviews Al Qaeda's use of public statements from the mid-1990s to the present, and analyzes the evolving ideological and political content of those statements. The report focuses primarily on statements made by Osama Bin Laden, but also considers statements made by his deputy Ayman Al Zawahiri, who some experts consider to be Al Qaeda's chief ideologue; remarks by Abu Musab Al Zarqawi, who has been recognized by Osama Bin Laden as an Al Qaeda ally and the leader of 'mujahideen' operations in Iraq; and a May 2005 statement from Al Qaeda military leader Sayf Al Adl. The report will be updated periodically. For background information, see CRS Report RS22049 'Al Qaeda: Profile and Threat Assessment.'
DTIC
Leadership; Networks; Public Relations; Warfare

20080030635 Library of Congress, Washington, DC USA
Critical Infrastructure Information Disclosure and Homeland Security
Moteff, John D; Stevens, Gina M; Aug 31, 2002; 23 pp.; In English
Report No.(s): AD-A480153; CRS-RL31547; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Critical infrastructures have been defined as those systems and assets so vital to the USA that the incapacity of such systems and assets would have a debilitating impact on the nation. One of the findings of the President's Commission on Critical Infrastructure Protection, established by President Clinton in 1996, was the need for the Federal Government and owners and operators of the nation's critical infrastructures to share information on vulnerabilities and threats. However, the Commission noted that owners and operators are reluctant to share confidential business information, and the government is reluctant to share information that might compromise intelligence sources or investigations. Among the strategies to help owners and operators share information with the Federal Government was a proposal to exempt the information they share from disclosure under the Freedom of Information Act (FOIA). The Freedom of Information Act (FOIA) was passed to ensure by statute citizen access to government information. Nine categories of information may be exempted from disclosure. Three of the nine exemptions provide possible protection against the release of critical infrastructure information: exemption 1 (national security information); exemption 3 (information exempted by statute); and exemption 4 (confidential business information). Congress has considered several proposals to exempt critical infrastructure information from the FOIA. Generally, the legislation has either created an exemption 3 statute, or codified the standard adopted by the D.C. Circuit in exemption 4 cases. Both House and Senate bills -- H.R. 5005 and S. 2452 -- that would establish the Department of Homeland Security include a FOIA exemption. Public interest groups argue that the language in the House bill is far too broad and would allow a wide range of information to be protected from disclosure, and that existing FOIA exemptions and case law provide sufficient protections.
DTIC
Information Transfer; Law (Jurisprudence); Protection; Security; United States

20080030655 Massachusetts Univ., Amherst, MA USA
Novelty Detection via Answer Updating
Li, Xiaoyan; Croft, W B; Jan 2004; 9 pp.; In English
Contract(s)/Grant(s): N66001-02-1-8903; MDA904-01-C-0984
Report No.(s): AD-A480233; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The detection of new and novel information in a document stream is an important component of potential applications. This paper describes an answer updating approach to novelty detection at the sentence level. Specifically, we explore the use of question-answering techniques for novelty detection. New information is defined as new/previously unseen answers to questions representing a user's information need. A sentence is treated as novel sentence if the system believes that it may contain a previously unseen answer to the question. In our answer updating approach, there are two important steps: question formulation and new answer detection. Experiments were carried out on data from the TREC 2002 novelty track using the proposed approach. The results show that novelty detection via answer updating outperforms other novelty measures reported in the literature in terms of precision at low recall.
DTIC
Detection; Information Retrieval; User Requirements

20080030669 National Inst. of Standards and Technology, Gaithersburg, MD USA
Metrology for Information Technology
Carnahan, Lisa; Carver, Gary; Gray, Martha; Hogan, Mike; Hopp, Theodore; Horlick, Jeffrey; Lyon, Gordon; Messina, Elena; May 1997; 31 pp.; In English
Report No.(s): AD-A480358; NISTIR-6025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In May 1996, NIST management requested a white paper on metrology for information technology (IT). A task group was formed to develop this white paper with representatives from the Manufacturing Engineering Laboratory (MEL), the Information Technology Laboratory (ITL), and Technology Services (TS). The task group members had a wide spectrum of experiences and perspectives on testing and measuring physical and IT quantities. The task group believed that its collective experience and knowledge were probably sufficient to investigate the underlying question of the nature of IT metrology. During the course of its work, the task group did not find any previous work addressing the overall subject of metrology for IT. The task group found it to be both exciting and challenging to possibly be first in what should be a continuing area of study. After some spirited deliberations, the task group was able to reach consensus on its white paper. Also, as a result of its deliberations, the task group decided that this white paper should suggest possible answers rather than assert definitive conclusions. In this spirit, the white paper suggests: a scope and a conceptual basis for IT metrology; a taxonomy for IT methods of testing; status of IT testing and measurement; opportunities to advance IT metrology; overall roles for NIST; and recapitulates the importance of IT metrology to the U.S. The task group is very appreciative of having had the opportunity to produce this white paper. The task group hopes that this white paper will provide food for thought for our intended audience: NIST management and technical staff and our colleagues elsewhere who are involved in various aspects of testing and measuring IT.
DTIC
Digital Systems; Information Systems; Metrology

20080030849 Naval Academy, Annapolis, MD USA
Enhancing Text Analysis via Dimensionality Reduction
Underhill, David G; McDowell, Luke K; Marchette, David J; Solka, Jeffrey L; Aug 2007; 7 pp.; In English
Report No.(s): AD-A479796; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479796

Many applications require analyzing vast amounts of textual data, but the size and inherent noise of such data can make processing very challenging. One approach to these issues is to mathematically reduce the data so as to represent each document using only a few dimensions. Techniques for performing such 'dimensionality reduction' (DR) have been well-studied for geometric and numerical data, but more rarely applied to text. In this paper, we examine the impact of five DR techniques on the accuracy of two supervised classifiers on three textual sources. This task mirrors important real world problems, such as classifying web pages or scientific articles. In addition, the accuracy serves as a proxy measure for how well each DR technique preserves the inter-document relationships while vastly reducing the size of the data, facilitating more sophisticated analysis. We show that, for a fixed number of dimensions, DR can be very successful at improving accuracy compared to using the original words as features. Surprisingly, we also find that one of the simplest DR techniques,

Multi-dimensional Scaling (MDS), is among the most effective. This suggests that textual data may often lie upon a linear manifold where the more complex non-linear DR techniques do not have an advantage.
DTIC
Classifications; Data Processing; Texts

20080030880 General Dynamics Decision Systems, Scottsdale, AZ USA
Gemini: Extending Information Management for Real Time Tactical Environments
Merrill, Derek; Mar 2008; 63 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-06-C-0067; Proj-C41E
Report No.(s): AD-A480203; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is the Final Technical Report for the Joint Battlespace Infosphere (JBI) Gemini program, herein referred to as Gemini. The objective of this document is to describe the technical lessons learned, results achieved, and characteristics of the product offering which we have developed within this initial Gemini contract. Gemini focused on the challenges presented by highly dynamic networks and implementing a relatively lightweight and yet robust architecture. JBI is an information management system that provides users with the specific information required for them to perform their functional responsibilities during crisis or conflict. JBI integrates data from a wide variety of sources, aggregates this information, and distributes the information in the appropriate form and level of detail to users at all echelons. The JBI platform for brokering information from a distributed JBI repository provides the following core services to JBI clients : publish, subscribe, query, and control.
DTIC
Data Management; Information Management; Information Systems; Real Time Operation; Warfare

20080030887 Air Force Research Lab., Rome, NY USA
Investigating the Fundamentals of the Third Generation Wargame: Wargaming, a Course for Future Development
Ross, David O; Mar 2008; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-558S
Report No.(s): AD-A480147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This effort investigated methods to provide superior decision support primarily for dynamic planning and execution in support of both Crisis Action Plans and Deliberate Planning. This was accomplished by evaluating current Air Force wargaming methods and looking at ways to improve them. Issues with current wargaming methods were identified while methods for improving them were developed, leading to improved methods for future wargames and combat mission planning.
DTIC
Decision Support Systems; War Games

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*.

20080029282 NASA Johnson Space Center, Houston, TX, USA
Earth Satellite Population Instability: Underscoring the Need for Debris Mitigation
Liou, Jer-chyi; Johnson, N. L.; [2006]; 12 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

A recent study by NASA indicates that the implementation of international orbital debris mitigation measures alone will not prevent a significant increase in the artificial Earth satellite population, beginning in the second half of this century. Whereas the focus of the aerospace community for the past 25 years has been on the curtailment of the generation of long-lived orbital debris, active remediation of the current orbital debris population should now be reconsidered to help preserve near-Earth space for future generations. In particular, we show in this paper that even if launch operations were to cease today, the population of space debris would continue to grow. Further, proposed remediation techniques do not appear to offer a viable solution. We therefore recommend that, while the aerospace community maintains the current debris-limiting mission regulations and postmission disposal procedures, future emphasis should be placed on finding new remediation technologies for solving this growing problem. Since the launch of Sputnik 1, space activities have created an orbital debris environment that poses increasing impact risks to existing space systems, including human space flight and robotic missions (1, 2).

Currently, more than 9,000 Earth orbiting man-made objects (including many breakup fragments), with a combined mass exceeding 5 million kilograms, are tracked by the US Space Surveillance Network and maintained in the US satellite catalog (3-5). Three accidental collisions between cataloged satellites during the period from late 1991 to early 2005 have already been documented (6), although fortunately none resulted in the creation of large, trackable debris clouds. Several studies conducted during 1991-2001 demonstrated, with assumed future launch rates, the unintended growth potential of the Earth satellite population, resulting from random, accidental collisions among resident space objects (7-13). In some low Earth orbit (LEO) altitude regimes where the number density of satellites is above a critical spatial density, the production rate of new satellites (i.e., debris) due to collisions exceeds the loss of objects due to orbital decay. NASA s evolutionary satellite population model LEGEND (LEO-to-GEO Environment Debris model), developed by the Orbital Debris Program Office at the NASA Lyndon B. Johnson Space Center, is a high fidelity three-dimensional physical model that is capable of simulating the historical satellite environment, as well as the evolution of future debris populations (14, 15). The subject study assumed no rocket bodies and spacecraft were launched after December 2004, and no future disposal maneuvers were allowed for existing spacecraft, few of which currently have such a capability. The rate of satellite explosions would naturally decrease to zero within a few decades as the current satellite population ages. The LEGEND future projection adopts a Monte Carlo approach to simulate future on-orbit explosions and collisions. Within a given projection time step, once the explosion probability is estimated for an intact object, a random number is drawn and compared with the probability to determine if an explosion would occur. A similar procedure is applied to collisions for each pair of target and projectile involved within the same time step. Due to the nature of the Monte Carlo process, multiple projection runs must be performed and analyzed before one can draw reliable and meaningful conclusions from the outcome. A total of fifty, 200-year future projection Monte Carlo simulations were executed and evaluated (16).
Derived from text
Artificial Satellites; Earth Orbital Environments; Populations; Three Dimensional Models

20080030131 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Technology 5 Observations of Auroral Field-Aligned Currents
Slavin, James; [2008]; 1 pp.; In English; 37th COSPAR Scientific Assembly 2008; No Copyright; Avail.: Other Sources; Abstract Only

During its three month long technology validation mission, Space Technology 5 (ST-5) returned high quality multi-point measurements of the near-Earth magnetic field. Its three micro-satellites were launched into a 300 x 4500 km, dawn - dusk, sun synchronous orbit (inclination = 105.60) orbit with a period of 138 min by a Pegasus launch vehicle on March 22, 2006. The spacecraft were maintained in a ‘pearls on a sting’ constellation with controlled spacings ranging from just over 5000 km down to under 50 km. The individual micro-satellites were 48 cm tall octagons with diameters of 50 cm. They were spin-stabilized at approximately 20 rpm at deployment and slowly spun-down to about 15 rpm by the end of the mission. Each spacecraft carried a miniature tri-axial fluxgate magnetometer (MAG) provided by the University of California at Los Angeles mounted at the end of a ultra-low mass 72 cm boom. These data allow, for the first time, the separation of temporal and spatial variations in field-aligned current (FAC) perturbations measured in low-Earth orbit on time scales of 10 sec to 10 min. The constellation measurements are used to directly determine field-aligned current sheet motion, thickness. and current density. Two multi-point methods for the inference of FAC current density that have not previously been possible in low-Earth orbit are demonstrated: 1) the -standard method.’ based upon s/c velocity, but corrected for FAC current sheet motion. and 2) the ‘gradiometer method’ which uses simultaneous magnetic field measurements at two points with known separation. Future studies will apply these methods to the entire ST-5 data sct and expand to include horizontal ionospheric currents. ULF waves and geomagnetic field gradient analyses.
Author
Auroras; Constellations; Field Aligned Currents; Ionospheric Currents; Low Earth Orbits; Geomagnetism; Current Density

20080030141 NASA Goddard Space Flight Center, Greenbelt, MD, USA
International Heliophysical Year Contributions to Space Weather Research
Davila, Joseph M.; April 30, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The International Heliophysical Year (IHY) is concerned with the study of universal processes in the heliosphere, and international scientific cooperation. The result has been an international cooperative effort, jointly with the United Nations COPUOS, to study process which form the basis of our understanding of Space Weather. It this talk I will review the objectives of the IHY, and the progress made in the deployment of several instrument arrays and investigations which study space weather phenomena.
Author
Heliosphere; Space Weather

20080030209 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Lessons Learned from Previous Space-Borne Sounders as a Guide to Future Sounder Development

Benson, Robert F.; Deshpande, Manohar D.; Farrell,William M.; Fung, Shing F.; Osherovich, Vladimir A.; Pfaff, Rovert E.; Rowland, Douglas E.; Adrian, Mark L.; August 10, 2008; 1 pp.; In English; Dynamical Processes in Space Plasmas, 10-15 Aug. 2008, Chicago, Il, USA; Copyright; Avail.: Other Sources; Abstract Only

Space-borne radio sounding is considered to be the gold standard for electron-density (N(sub e)) measurements compared to other techniques even under low-density conditions, such as N(sub e) < 1/cu cm, when other techniques are known to experience difficulties. These reliable measurements are not restricted to in-situ N(sub e) determinations since a spaceborne sounder can provide vertical N(sub e) profiles (N(sub e)(h)) from the spacecraft altitude to the altitude of maximum N(sub e). Near-conjunction studies involving the International Satellites for Ionospheric Studies (ISIS) satellites in the topside ionosphere and Dynamics Explorer 2 (DE 2) near the altitude of the F-region peak density have verified that, even at the greatest distance from the sounder, the ISIS-derived N(sub e)(h) profiles agree with the DE-2 Langmuir-probe measurements to within about 30% over a density range of more than two decades. Space-borne sounders can also provide N(sub e) profiles along the magnetic-field B, by inverting echoes that are ducted along field-aligned irregularities (FAI), and can provide information about the terrain beneath the satellite by examining surface reflections in the frequency range above the ionospheric penetration frequency. Many nations have launched rocket and satellite radio sounders in geospace over more than 4 decades and there have been sounders on space-probes and in orbit around other planets. Here we will summarize some of the lessons learned from these accomplishments by analyzing data from radio sounders on the Alouette and ISIS satellites and the OEDIPUS and other rockets in the terrestrial ionosphere, the IMAGE satellite in the terrestrial magnetosphere, the Ulysses space probe in Jupiter's 10 plasma torus and the MARSIS satellite in orbit around Mars. The emphasis will be on information deduced concerning (1) fundamental plasma processes and gradients in N, and B in the vicinity of the sounders from sounder-stimulated plasma resonances and short-range echoes involving ion as well as electron motions, (2) the importance of the antenna orientation relative to B for the detection of different plasma resonances, (3) sounder-stimulated plasma phenomena, including FAI, when special plasma conditions are satisfied, (4) the minimum power required for long-range echoes, as indicated by echoes from frequency components of the transmitted pulse and by multiple ducted echoes, and (5) the terrain beneath the satellite from surface reflections. Knowledge of these results should enable the optimum design of a future sounder to satisfy specific science requirements with minimal spacecraft resources.

Author

Atmospheric Sounding; Radio Echoes; Lessons Learned; Frequency Ranges; Electrostatic Probes; Artificial Satellites; Plasma Resonance; Space Probes; Sounding

20080030244 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Space Weather Models at the CCMC And Their Capabilities

Hesse, Michael; Rastatter, Lutz; MacNeice, Peter; Kuznetsova, Masha; December 09, 2007; 1 pp.; In English; American Geophysical Union (AGU) 2007 Fall Meeting, 9-14 Dec. 2007, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Community Coordinated Modeling Center (CCMC) is a US inter-agency activity aiming at research in support of the generation of advanced space weather models. As one of its main functions, the CCMC provides to researchers the use of space science models, even if they are not model owners themselves. The second focus of CCMC activities is on validation and verification of space weather models, and on the transition of appropriate models to space weather forecast centers. As part of the latter activity, the CCMC develops real-time simulation systems that stress models through routine execution. A by-product of these real-time calculations is the ability to derive model products, which may be useful for space weather operators. In this presentation, we will provide an overview of the community-provided, space weather-relevant, model suite, which resides at CCMC. We will discuss current capabilities, and analyze expected future developments of space weather related modeling.

Author

Space Weather; Models

20080030344 NASA Goddard Space Flight Center, Greenbelt, MD, USA

MESSENGER Observation of Mercury's Magnetopause: Structure and Dynamics

Slavin, J. A.; Acuna, M. H.; Anderson, B. J.; Baker, D. N.; Benna, M.; Boardsen, S. A.; Gloeckler, G.; Gold, R. E.; Ho, G. C.; Korth, H.; Krimigis, S. M.; Livi, S. A.; McNutt, R. L., Jr.; Raines, J. M.; Sarantos, M.; Schriver, D.; Solomon, S. C.; Travnicek, P.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

MESSENGER'S 14 January 2008 encounter with Mercury has provided new observations of the magnetopause of this

small magnetosphere, particularly concerning the effect of the direction of the interplanetary magnetic field (IMF) on the structure and dynamics of this boundary. The IMF was northward immediately prior to and following the passage of the MESSENGER spacecraft through Mercury's magnetosphere. However, several-minute episodes of southward IMF were observed in the magnetosheath during the inbound portion of the encounter. Evidence for reconnection at the dayside magnetopause in the form of well-developed flux transfer events (FTEs) was observed in the magnetosheath following some of these southward-B, intervals. The inbound magnetopause crossing seen in the magnetic field measurements is consistent with a transition from the magnetosheath into the plasma sheet. Immediately following MESSENGER'S entry into the magnetosphere, rotational perturbations in the magnetic field similar to those seen at the Earth in association with large-scale plasma sheet vortices driven by Kelvin-Helmholtz waves along the magnetotail boundary at the Earth were observed. The outbound magnetopause occurred during northward IMF B(sub z) and had the characteristics of a tangential discontinuity. These new observations by MESSENGER may be combined and compared with the magnetopause measurements collected by Mariner 10 to derive new understanding of the response of Mercury's magnetopause to IMF direction and its effect on the rate of solar wind energy and mass input to this small magnetosphere.
Author
Messenger (Spacecraft); Mercury (Planet); Magnetopause; Interplanetary Magnetic Fields; Flux Transfer Events; Magnetic Fields

20080030346 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MESSENGER: Exploring Mercury's Magnetosphere
Slavin, James A.; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The MESSENGER mission to Mercury offers our first opportunity to explore this planet's miniature magnetosphere since Mariner 10's brief fly-bys in 1974-5. Mercury's magnetosphere is unique in many respects. The magnetosphere of Mercury is the smallest in the solar system with its magnetic field typically standing off the solar wind only - 1000 to 2000 km above the surface. For this reason there are no closed dri-fi paths for energetic particles and, hence, no radiation belts; the characteristic time scales for wave propagation and convective transport are short possibly coupling kinetic and fluid modes; magnetic reconnection at the dayside magnetopause may erode the subsolar magnetosphere allowing solar wind ions to directly impact the dayside regolith; inductive currents in Mercury's interior should act to modify the solar In addition, Mercury's magnetosphere is the only one with its defining magnetic flux tubes rooted in a planetary regolith as opposed to an atmosphere with a conductive ionosphere. This lack of an ionosphere is thought to be the underlying reason for the brevity of the very intense, but short lived, approx. 1-2 min, substorm-like energetic particle events observed by Mariner 10 in Mercury's magnetic tail. In this seminar, we review what we think we know about Mercury's magnetosphere and describe the MESSENGER science team's strategy for obtaining answers to the outstanding science questions surrounding the interaction of the solar wind with Mercury and its small, but dynamic magnetosphere.
Author
Messenger (Spacecraft); Mercury (Planet); Space Missions; Planetary Magnetospheres; Magnetic Field Reconnection; Magnetopause; Magnetic Storms; Energetic Particles; Miniaturization

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080030108 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Construction of Penrose Diagrams for Dynamic Black Holes
Brown, Beth A.; Lindesay, James; January 2008; 1 pp.; In English; Annual Conference of the National Society of Black Physicists, 20-24 Feb. 2008, Washington, DC, USA; No Copyright; Avail.: Other Sources; Abstract Only

A set of Penrose diagrams is constructed in order to examine the large-scale causal structure of black holes with dynamic horizons. Coordinate dependencies of significant features, such as the event horizon and radial mass scale, are demonstrated on the diagrams. Unlike in static Schwarzschild geometries, the radial mass scale is clearly seen to differ from the horizon. Trajectories for photons near the horizon are briefly discussed.
Author
Black Holes (Astronomy); Photons; Trajectories

20080030116 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Gamma Ray Burst Discoveries with the Swift Mission

Gehrels, Neil; January 12, 2008; 17 pp.; In English; Original contains poor quality, truncated or crooked pages; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030116

Gamma-ray bursts (GRBs) are among the most fascinating occurrences in the universe. They are powerful explosions, visible to high redshift, and thought to be the signature of black hole formation. The Swift Observatory has been detecting 100 bursts per year for 3 years and has greatly stimulated the field with new findings. Observations are made of the X-ray and optical afterglow from approximately 1 minute after the burst, continuing for days. Evidence is building that the long and short duration subcategories of GRBs have very different origins: massive star core collapse to a black hole for long bursts and binary neutron star coalescence to a black hole for short bursts. The similarity to Type II and Ia supernovae originating from young and old stellar progenitors is striking. Bursts are providing a new tool to study the high redshift universe. Swift has detected several events at z greater than 5 and one at z=6.3 giving metallicity measurements and other data on galaxies at previously inaccessible distances. The talk will present the latest results from Swift in GRB astronomy.

Author

Gamma Ray Bursts; Swift Observatory; Red Shift; Gamma Ray Astronomy

20080030230 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Analysis of the Interactions of Planetary Waves with the Mean Flow of the Stratosphere

Newman, Paul A.; December 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

During the winter period, large scale waves (planetary waves) are observed to propagate from the troposphere into the stratosphere. Such wave events have been recognized since the 1 950s. The very largest wave events result in major stratospheric warmings. These large scale wave events have typical durations of a few days to 2 weeks. The wave events deposit easterly momentum in the stratosphere, decelerating the polar night jet and warming the polar region. In this presentation we show the typical characteristics of these events via a compositing analysis. We will show the typical periods and scales of motion and the associated decelerations and warmings. We will illustrate some of the differences between major and minor warming wave events. We will further illustrate the feedback by the mean flow on subsequent wave events.

Author

Atmospheric Heating; Stratosphere; Wave Interaction; Planetary Waves; Troposphere

20080030274 NASA Goddard Space Flight Center, Greenbelt, MD, USA

High-Resolution N-Band Observations of the Nova Rs Ophiuchi: First Science with the Keck Interferometer Nuller

Danchi, William; January 07, 2008; 1 pp.; In English; American Astronomical Society Meeting, 17 Oct. 2007, Austin, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

We report new observations of the nova RS Ophiuchi using the Keck Interferometer Nulling Instrument (KIN), approximately 3.8 days following the most recent outburst that occurred on 2006 February 12. These observations represent the first scientific results from the KIN, which operates in N-band from 8 to 12.5 microns. The nulling technique is the sparse aperture equivalent of the conventional coronagraphic technique used in filled aperture telescopes. By fitting the unique KIN inner and outer spatial regime data, we have obtained an angular size of the mid-infrared continuum of 6.2,4.0, or 5.4 mas for a disk profile, Gaussian profile, and shell profile respectively. The data show evidence of enhanced neutral atomic hydrogen emission and atomic metals including silicon located in the inner spatial regime near the white dwarf relative to the outer regime. There are also nebular emission lines and evidence of hot silicate dust in the outer spatial region, centered at approximately 2.5E14 cm from the WD, that are not found in the inner regime. The nova flash in the outer spatial regime evidently excited these features before the blast wave reached these regions. These identifications support the following interpretation. The dust appears to be present between outbursts and was not created during the outburst event. We further discuss the present results in terms of a unifying model of the system that includes an increase in density in the plane of the orbit of the two stars created by a spiral shock wave caused by the motion of the stars through the cool wind of the red giant star. These data show the power and potential of the nulling technique which has been developed for the detection of Earthlike planets around nearby stars for the Terrestrial Planet Finder Mission and Darwin missions.

Author

Astronomical Interferometry; Novae; Infrared Interferometers

20080030334 NASA Goddard Space Flight Center, Greenbelt, MD, USA
X-Ray Dust Scattering At Small Angles: The Complete Halo Around GX13+1
Smith, Randall K.; [2007]; 7 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): GO-6144X; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030334

The exquisite angular resolution available with Chandra should allow precision measurements of faint diffuse emission surrounding bright sources, such as the X-ray scattering halos created by interstellar dust. However, the ACIS CCDs suffer from pileup when observing bright sources, and this creates difficulties when trying to extract the scattered halo near the source. The initial study of the X-ray halo around GX13+1 using only the ACIS-I detector done by Smith, Edgar & Shafer (2002) suffered from a lack of sensitivity within 50' of the source, limiting what conclusions could be drawn. To address this problem, observations of GX13+1 were obtained with the Chandra HRC-I and simultaneously with the RXTE PCA. Combined with the existing ACIS-I data, this allowed measurements of the X-ray halo between 2-1000'. After considering a range of dust models, each assumed to be smoothly distributed with or without a dense cloud along the line of sight, the results show that there is no evidence in this data for a dense cloud near the source, as suggested by Xiang et al. (2005). In addition, although no model leads to formally acceptable results, the Weingartner & Draine (2001) and all but one of the composite grain models from Zubko, Dwek & Arendt (2004) give particularly poor fits.
Author
X Ray Scattering; Cosmic Dust; Interstellar Matter; X Ray Timing Explorer; Halos; Line of Sight

20080030338 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Variability of Disk Emission in Pre-Main Sequence and Related Stars. I. HD 31648 and HD 163296 - Isolated Herbig Ae Stars Driving Herbig-Haro Flows
Sitko, Michael L.; Carpenter, William J.; Kimes, Robin L.; Lynch, David K.; Russell, Ray W.; Rudy, Richard J.; Mazuk, Stephan M.; Venturini, Catherine C.; Puetter, Richard C.; Grady, Carol A.; Polomski, Elisha F.; Wisnewski, John P.; Brafford, Suellen M.; Hammel, H. B.; Perry, Raleigh B.; December 24, 2007; 55 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNH06CC03B; Copyright; Avail.: CASI: A04, Hardcopy

Infrared photometry and spectroscopy covering a time span of a quarter century are presented for HD 31648 (MWC 480) and HD 163296 (MWC 275). Both are isolated Herbig Ae stars that exhibit signs of active accretion, including driving bipolar flows with embedded Herbig-Haro (HH) objects. HD 163296 was found to be relatively quiescent photometrically in its inner disk region, with the exception of a major increase in emitted flux in a broad wavelength region centered near 3 pm in 2002. In contrast, HD 31648 has exhibited sporadic changes in the entire 3-13 pm region throughout this span of time. In both stars the changes in the 1-5 pm flux indicate structural changes in the region of the disk near the dust sublimation zone, possibly causing its distance from the star to vary with time. Repeated thermal cycling through this region will result in the preferential survival of large grains, and an increase in the degree of crystallinity. The variability observed in these objects has important consequences for the interpretation of other types of observations. For example, source variability will compromise models based on interferometry measurements unless the interferometry observations are accompanied by nearly-simultaneous photometric data.
Author
Infrared Photometry; Stellar Envelopes; Pre-Main Sequence Stars; Thermal Cycling Tests; Protoplanetary Disks; A Stars

20080030339 NASA Goddard Space Flight Center, Greenbelt, MD, USA
X-Ray Emitting Ejecta in Puppis A Observed with Suzaku
Hwang, U.; Petre, R.; Flanagan, K.; [2008]; 25 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We report the detection and localization of X-ray emitting ejecta in the middle-aged Galactic supernova remnant Puppis A using five observations with the Suzaku X-ray Imaging Spectrometer to survey the eastern and middle portions of the remnant. A roughly 3' x 5', double-peaked region in the north center is found to be highly enriched in Si and other elements relative to the rest of the remnant. The X-ray fitted abundances are otherwise well below the solar values. While the ejecta-enhanced regions show some variation of relative element abundances, there is little evidence for a very strong enhancement of one element over the others in the imaged portion of the remnant, except possibly for a region of 0 and Ne enhancement in the remnant's south center. There is no spatial correlation between the compact [0 1111 emitting ejecta knots seen optically and the abundance enhancements seen in X-rays, although they are located in the same vicinity. The map of fitted column density shows strong variations across the remnant that echo earlier X-ray spectral hardness maps. The ionization

age (as fitted for single temperature models) is sharply higher in a ridge behind the northeast-east boundary of the remnant, and is probably related to the strong molecular cloud interaction along that boundary. The temperature map, by comparison, shows relatively weak variations.
Author
Ejecta; X Ray Imagery; Supernova Remnants; Molecular Clouds; Imaging Spectrometers; Augmentation; X Rays

20080030340 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Sensitivity of Coded Mask Telescopes
Skinner, Gerald K.; [2008]; 10 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030340

Simple formulae are often used to estimate the sensitivity of coded mask X-ray or gamma-ray telescopes, but t,hese are strictly only applicable if a number of basic assumptions are met. Complications arise, for example, if a grid structure is used to support the mask elements, if the detector spatial resolution is not good enough to completely resolve all the detail in the shadow of the mask or if any of a number of other simplifying conditions are not fulfilled. We derive more general expressions for the Poisson-noise-limited sensitivity of astronomical telescopes using the coded mask technique, noting explicitly in what circumstances they are applicable. The emphasis is on using nomenclature and techniques that result in simple and revealing results. Where no convenient expression is available a procedure is given which allows the calculation of the sensitivity. We consider certain aspects of the optimisation of the design of a coded mask telescope and show that when the detector spatial resolution and the mask to detector separation are fixed, the best source location accuracy is obtained when the mask elements are equal in size to the detector pixels.
Author
X Ray Telescopes; Sensitivity; Spatial Resolution; Gamma Ray Telescopes; Coding; Optimization; Pixels

20080030363 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Spatial and Alignment Analyses for a field of Small Volcanic Vents South of Pavonis Mons Mars
Bleacher, J. E.; Glaze, L. S.; Greeley, R.; Hauber, E.; Baloga, S. M.; Sakimoto, S. E. H.; Williams, D. A.; Glotch, T. D.; March 10, 2008; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 10-14 Mar. 2008, Houston, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Tharsis province of Mars displays a variety of small volcanic vent (10s krn in diameter) morphologies. These features were identified in Mariner and Viking images [1-4], and Mars Orbiter Laser Altimeter (MOLA) data show them to be more abundant than originally observed [5,6]. Recent studies are classifying their diverse morphologies [7-9]. Building on this work, we are mapping the location of small volcanic vents (small-vents) in the Tharsis province using MOLA, Thermal Emission Imaging System, and High Resolution Stereo Camera data [10]. Here we report on a preliminary study of the spatial and alignment relationships between small-vents south of Pavonis Mons, as determined by nearest neighbor and two-point azimuth statistical analyses. Terrestrial monogenetic volcanic fields display four fundamental characteristics: 1) recurrence rates of eruptions,2) vent abundance, 3) vent distribution, and 4) tectonic relationships [11]. While understanding recurrence rates typically requires field measurements, insight into vent abundance, distribution, and tectonic relationships can be established by mapping of remotely sensed data, and subsequent application of spatial statistical studies [11,12], the goal of which is to link the distribution of vents to causal processes.
Author
Spatial Distribution; Mars Volcanoes; Thermal Emission; Tectonics; Remote Sensing; Mars Global Surveyor; Display Devices

20080030369 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Detection With Rhessi of High Frequency X-ray Oscillations in the Tail of the 2004 Hyperflare From SGR 1806-20
Watts, Anna L.; Strohmayer, Tod E.; January 2005; 4 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The recent discovery of high frequency oscillations in giant flares from SGR 1806-20 and SGR 1900+14 may be the first direct detection of vibrations in a neutron star crust. If this interpretation is correct it offers a novel means of testing the neutron star equation of state, crustal breaking strain, and magnetic field configuration. Using timing data from RHESSI, we have confirmed the detection of a 92.5 Hz Quasi-Periodic Oscillation (QPO) in the tail of the SGR 1806-20 giant flare. We also find another, stronger, QPO at higher energies, at 626.5 Hz. Both QPOs are visible only at particular (but different) rotational

phases, implying an association with a specific area of the neutron star surface or magnetosphere. At lower frequencies we confirm the detection of an 18 Hz QPO, at the same rotational phase as the 92.5 Hz QPO, and report the additional presence of a broad 26 Hz QPO. We are however unable to make a robust confirmation of the presence of a 30 Hz QPO, despite higher count rates. We discuss our results in the light of neutron star vibration models.
Author
Detection; High Frequencies; Oscillations; Stellar Models; X Rays; Periodic Variations; Soft Gamma Repeaters

20080030460 University of Central Arkansas, Conway, AR USA
Late-Type Near-Contact Eclipsing Binary [HH97] FS AUR-79
Austin, S J; Robertson, J W; Tycner, C; Campbell, T; Honeycutt, R K; May 2007; 14 pp.; In English
Report No.(s): AD-A479851; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA479851

The secondary photometric standard star number 79 for the FS Aur field (Henden & Honeycutt 1997), designated as [HH97] FS Aur-79 (GSC 1874-399) is a short-period (0.2508 days) eclipsing binary whose light curve is a combination of the Beta Lyr and BY Dra type variables. High signal-to-noise ratio multicolor photometry was obtained using the US Naval Observatory 1 m telescope. These light curves show asymmetry at quadrature phases (the O'Connell effect), which can be modeled with the presence of starspots. A low-resolution spectrum obtained with the 3.5 m Wisconsin-Indiana- Yale-NOAO telescope at orbital phase 0.76 is consistent with a spectral type of dK7e and dM3e. A radial velocity curve for the primary star was constructed using 24 high-resolution spectra from the 9.2 m Hobby-Eberly Telescope. Spectra show Halpha and HBeta in emission confirming chromospheric activity and possibly the presence of circumstellar material. Binary star models that simultaneously fit the U, B, V, R, and radial velocity curves are those with a primary star of mass 0.59 +/- 0.02 M , temperature 4100 +/- 25 K, and mean radius 0.67 R, just filling its Roche lobe, and a secondary star of mass 0.31 +/- 0.09 M, temperature 3425 +/- 25 K, and mean radius 0.48 R, just within its Roche lobe. An inclination angle of 83 deg +/- 2 deg with a center-of-mass separation of 1.62 R is also derived. Starspots, expected for a rotation period of less than 1 day, had to be included in the modeling to fit the O'Connell effect.
DTIC
Binary Stars; Eclipses; Eclipsing Binary Stars; Stars

20080030574 Naval Research Lab., Washington, DC USA
A Spitzer IRS Low-Resolution Spectroscopic Search for Buried AGNs in Nearby Ultraluminous Infrared Galaxies: A Constraint on Geometry Between Energy Sources and Dust
Imanishi, Masatoshi; Dudley, C C; Maiolino, Roberto; Maloney, Philip R; Nakagawa, Takao; Risaliti, Guido; Jul 2007; 30 pp.; In English
Report No.(s): AD-A479974; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present the results of Spitzer Infrared Spectrograph low-resolution infrared 5 35 micrometers spectroscopy of nearby ultraluminous infrared galaxies (ULIRGs) at z < 0:15. We focus on the search for the signatures of buried active galactic nuclei (AGNs) in the complete sample of ULIRGs classified optically as non-Seyferts (LINERs or H ii regions). In addition to polycyclic aromatic hydrocarbon (PAH) emission features at 6.2, 7.7, and 11.3 micrometers, the conventional tool of starburst-AGN separation, we use the optical depths of the 9.7 and 18 micrometers silicate dust absorption features to infer the geometry of energy sources and dust at the nuclei of these ULIRGs, namely, whether the energy sources are spatially well mixed with dust (a normal starburst) or are more centrally concentrated than the dust (a buried AGN). Infrared spectra of at least 30%, and possibly 50%, of the observed optical non-Seyfert ULIRGs are naturally explained by emission consisting of (1) energetically insignificant, modestly obscured (AV < 20 30 mag) PAH-emitting normal starbursts and (2) energetically dominant, highly dust-obscured, centrally concentrated energy sources with no PAH emission. We interpret the latter component as a buried AGN. The fraction of ULIRGs showing some buried AGN signatures is higher in LINER ULIRGs than in H II region ULIRGs. Most of the luminous buried AGN candidates are found in ULIRGs with cool far-infrared colors. Where the absorption-corrected intrinsic AGN luminosities are derivable with little uncertainty, they are found to be of the order of 10(exp 12) L , accounting for the bulk of the ULIRGs luminosities. The 5 35 micrometers spectroscopic starburst/AGN classifications are generally consistent with our previous classifications based on 3 4 micrometers spectra for the same sample.
DTIC
Active Galactic Nuclei; Dust; Galaxies; Geometry; Infrared Radiation; Luminosity; Spectroscopy

20080030589 Naval Research Lab., Washington, DC USA

Gas at the Inner Disk Edge

Carr, John S; May 2007; 13 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Infrared molecular spectroscopy is a key tool for the observation of gas in the innermost region of disks around T Tauri stars. In this contribution, we examine how infrared spectroscopy of CO can be used to study the inner truncation region of disks around T Tauri stars. The inferred inner gas radii for T Tauri star disks are compared to the inner dust radii of disks, to the expectations of models for disk truncation, and to the orbital distribution of short-period extra-solar planets.

DTIC

Carbon Monoxide; Infrared Spectroscopy; Protoplanetary Disks; T Tauri Stars

20080030594 Naval Research Lab., Washington, DC USA

Disentangling the Dynamical Mechanisms for Cluster Galaxy Evolution

Zhang, Xiaolei; Feb 2008; 15 pp.; In English

Report No.(s): AD-A480026; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The determination of the dynamical causes of the morphological Butcher-Oemler (BO) effect, or the rapid transformation of a large population of late-type galaxies to earlier Hubble types in the rich cluster environment between intermediate redshifts and the local universe, has been an important unsolved problem that is central to our understanding of the general problems of galaxy formation and evolution. In this article, we survey the existing proposed mechanisms for cluster galaxy transformation, and discuss their relevance and limitations to the explanation of the morphological BO effect. A new infrared diagnostic approach is devised to disentangle the relative importance of several major physical mechanisms to account for the BO effect, and an example of the first application of this procedure to a single rich intermediate redshift galaxy cluster is given to demonstrate the viability of this approach. The preliminary result of this analysis favors the interaction-enhanced secular evolution process as the major cause of the cluster galaxy morphological transformation. This conclusion is also supported by a wide range of other published results that are assembled here to highlight their implications on a coherent physical origin for the morphological BO effect.

DTIC

Galaxies; Infrared Signatures; Stellar Evolution

20080030777 NASA Goddard Space Flight Center, Greenbelt, MD, USA

GLAST, the Gamma-ray Large Area Space Telescope

Ritz, Steven; October 02, 2007; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

The Gamma-ray Large Area Space Telescope, GLAST, is a mission to measure the cosmic gamma-ray flux in the energy range 20 MeV to greater than 300 GeV, with supporting measurements for gamma-ray bursts from 10 keV to 25 MeV. With its upcoming launch in 2008, GLAST will open a new and important window on a wide variety of phenomena, including black holes and active galactic nuclei; the optical-UV extragalactic background light, gamma-ray bursts; the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations and Lorentz invariance violation. In addition to the science opportunities, this talk includes a description of the instruments, the collaboration between particle physicists and astrophysicists, the opportunities for guest observers, and the mission status.

Author

Gamma Ray Telescopes; Gamma Ray Astronomy

20080030780 NASA Goddard Space Flight Center, Greenbelt, MD, USA

STEREO Education and Public Outreach Efforts

Kucera, Therese; September 2007; 1 pp.; In English; Astronomical Society of Pacific Meeting, 1-7 Sep.2007, Chicago, IL, USA; No Copyright; Avail.: Other Sources; Abstract Only

STEREO has had a big year this year with its launch and the start of data collection. STEREO has mostly focused on informal educational venues, most notably with STEREO 3D images made available to museums through the NASA Museum Alliance. Other activities have involved making STEREO imagery available though the AMNH network and Viewspace, continued partnership with the Christa McAuliffe Planetarium, data sonification projects, preservice teacher training, and learning activity development.

Author

STEREO (Observatory); Education; Imagery

20080030782 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Studying Galaxy Formation and Reionization with the James Webb Space Telescope

Gardner, Jonathan P.; February 10, 2008; 1 pp.; In English; The First Two Billion Years of Galaxy Formation, 10-16 Feb. 2008, Aspen, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

The deepest optical to infrared observations of the universe include the Hubble Deep Fields, the Great Observatories Origins Deep Survey and the recent Hubble Ultra-Deep Field. Galaxies are seen in these surveys at redshifts z>6, less than 1 Gyr after the Big Bang, at the end of a period when light from the galaxies has reionized Hydrogen in the inter-galactic medium. These observations, combined with theoretical understanding, indicate that the first stars and galaxies formed at z>10, beyond the reach of the Hubble and Spitzer Space Telescopes. To observe the first galaxies, NASA is planning the James Webb Space Telescope (JWST), a large (6.5m), cold (<50K), infrared-optimized observatory to be launched early in the next decade into orbit around the second Earth- Sun Lagrange point. JWST will have four instruments: The Near-Infrared Camera, the Near-Infrared multi-object Spectrograph, and the Tunable Filter Imager will cover the wavelength range 0.6 to 5 microns, while the Mid-Infrared Instrument will do both imaging and spectroscopy from 5 to 28.5 microns. I will review the current status of the project.

Author

Galactic Evolution; Infrared Astronomy; Tunable Filters; Galaxies; Infrared Radiation; Imaging Techniques; Red Shift; Spaceborne Telescopes

20080030859 Naval Research Lab., Washington, DC USA; Rutherford Appleton Lab., Oxford, UK; Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA; Alcala de Henares Univ., Madrid, Spain

High-Excitation OH and H2O Lines in Markarian 231: The Molecular Signatures of Compact Far-Infrared Continuum Sources

Gonzalez-Alfonso, Eduardo; Smith, Howard A; Ashby, Matthew L; Fischer, Jacqueline; Spinoglio, Luigi; Grundy, Timothy W; Mar 1, 2008; 14 pp.; In English

Report No.(s): AD-A480053; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The ISO LWS far-infrared spectrum of the ultraluminous galaxy Mrk 231 shows OH and H2O lines in absorption from energy levels up to 300 K above the ground state. Our analysis shows that OH and H2O are radiatively pumped by the far-infrared continuum emission of the galaxy. The absorptions in the high-excitation lines require high far-infrared radiation densities, allowing us to constrain the properties of the underlying continuum source. The bulk of the far-infrared continuum arises from a warm, optically thick medium of effective diameter 200-400 pc. In our best-fit model of total luminosity, the observed OH and H2O high-lying lines arise from a luminous region with radius ~100 pc.

DTIC

Continuums; Excitation; Far Infrared Radiation; Galaxies; Hydroxyl Emission; Line Spectra; Markarian Galaxies; Molecular Properties; Signatures; Water

20080030958 Science Systems and Applications, Inc., Lanham, MD, USA

Cosmic Infrared Background From Population III Stars and Its Effect on Spectra of High-z Gamma-Ray Bursts

Kashlinsky, A.; Astrophysical Journal Letters; October 14, 2005; 633, No. 1, pp. L5-L8; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF AST 04-06587; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1086/498243

We discuss the contribution of Population III stars to the near-IR (NIR) cosmic infrared background (CIB) and its effect on spectra of high-z, high-energy gamma-ray bursts (GRBs) and other sources. It is shown that if Population III is composed of massive stars, the claimed NIR CIB excess will be reproduced if only approx. 4% plus or minus 2% of all baryons went through these stars. Regardless of the precise amount of the NIR CIB due to them, they likely left enough photons to provide a large optical depth for high-energy photons from distant GRBs. Observations of such GRBs are expected following the planned launch of NASA's GLAST mission. Detecting such damping in the spectra of high-z GRBs will then provide important information on the emissions from the Population III epoch, and the location of this cutoff may serve as an indicator of the GRBs' redshifts. We also point out the difficulty of unambiguously detecting the CIB part originating from Population III in spectra of low-z blazars.

Author

Background Radiation; Gamma Ray Bursts; Infrared Radiation; Cosmology; Population III Stars; Astrophysics

20080030962 Curtin Univ. of Technology, Perth, Australia; NASA Johnson Space Center, Houston, TX, USA
Complex Histories of Two Lunar Zircons as Evidenced by their Internal Structures and U-Pb Ages
Pidgeon, R. T.; Nemchin, A. A.; Meyer, Charles; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The U-Pb dating of lunar zircon by ion-microprobe provides a robust technique for investigating the timing of lunar events [1,2]. However, we have now identified two cases where the U-Pb systems in a single zircon show more than one age. These complex zircons provide new opportunities for extending our knowledge on the timing of events in the early history of the Moon.
Derived from text
Moon; Time Measurement; Chronology

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080026344 NASA Johnson Space Center, Houston, TX, USA
Ar-Ar Dating of Martian Chassignites, NWA2737 and Chassigny, and Nakhlite MIL03346
Bogard, D. D.; Garrison, D. H.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): 344-31-30-01; Copyright; Avail.: CASI: A01, Hardcopy

Until recently only three nakhlites and one chassignite had been identified among martian meteorites. These four exhibit very similar radiometric ages and cosmic ray exposure (CRE) ages, indicating that they may have derived from a common location on Mars and were ejected into space by a single impact. This situation is quite different from that of martian shergottites, which exhibit a range of radiometric ages and CRE ages (1). Recently, several new nakhlites and a new martian dunite (NWA2737) have been recognized. Here we report our results of Ar-39-Ar-40 dating for the MIL03346 nakhlite and the NWA2737 'chassignite', along with new results on Chassigny.
Author
Argon; Cosmic Rays; Time Measurement; Nakhlites; SNC Meteorites; Radiometers

20080030113 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Eta Carinae: An Astrophysical Laboratory
Gull, T.; February 16, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

In the 1840s, Eta Carinae, a massive binary near the end of its hydrogen burning cycle, ejected at least ten solar masses of material rich in nitrogen at the expense of carbon and oxygen. The resultant chemistry has led to a most peculiar mix of metals, molecules and dust. We identify thousands of nebular absorption lines of ions including Fe, Ni, V, Sr, Sc and molecules including H2, CH, OH, but no CO. Today we see a wind-enshrouded massive binary in the center of an expanding neutral hourglass and skirt. A similar ionized internal structure is associated with a lesser ejection of the 1890s. Both systems respond to the 5.54-year modulation of X-ray and ultraviolet radiation as the less massive, hotter companion plunges through the extended wind of the more massive, cooler primary. Observations and models are being brought together to understand the properties of the wind-enshrouded central binary. In turn we are learning much atomic spectroscopy, what molecules form in oxygen-and carbon-deprived environments and potentially about a dust that is quite different from the interstellar dust. As the next periastron occurs in January 2009, a number of observing teams are preparing to test these models with new observations.
Author
Binary Stars; Astrophysics; Stellar Mass Ejection; Interstellar Chemistry

20080030114 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Prospects for Studying Interstellar Magnetic Fields with a Far-Infrared Polarimeter for SAFIR
Dowell, C. Darren; Chuss, D. T.; Dotson, J. L.; January 07, 2008; 1 pp.; In English; 211th Meeting of the American Astronomical Society, 7-11 Jan. 2008, Austin, TX, USA; No Copyright; Avail.: Other Sources; Abstract Only

Polarimetry at mid-infrared through millimeter wavelengths using airborne and ground-based telescopes has revealed magnetic structures in dense molecular clouds in the interstellar medium, primarily in regions of star formation. Furthermore, spectropolarimetry has offered clues about the composition of the dust grains and the mechanism by which they are aligned

with respect to the local magnetic field. The sensitivity of the observations to date has been limited by the emission from the atmosphere and warm telescopes. A factor of 1000 in sensitivity can be gained by using instead a cold space telescope. With 5 arcminute resolution, Planck will make the first submillimeter polarization survey of the full Galaxy early in the next decade. We discuss the science case for and basic design of a far-infrared polarimeter on the SAFIR space telescope, which offers resolution in the few arcsecond range and wavelength selection of cold and warm dust components. Key science themes include the formation and evolution of molecular clouds in nearby spiral galaxies, the magnetic structure of the Galactic center, and interstellar turbulence.
Author
Interstellar Magnetic Fields; Polarimeters; Infrared Astronomy; Telescopes; Polarimetry

20080030115 NASA Goddard Space Flight Center, Greenbelt, MD, USA; NASA Ames Research Center, Moffett Field, CA, USA
Binary Black Hole Mergers, Gravitational Waves, and LISA
Centrella, Joan; Baker, J.; Boggs, W.; Kelly, B.; McWilliams, S.; vanMeter, J.; January 07, 2008; 1 pp.; In English; AAS Meeting, 7-11 Jan. 2008, Austin, TX, USA
Contract(s)/Grant(s): 06-BEFS06-19; No Copyright; Avail.: Other Sources; Abstract Only

The final merger of comparable mass binary black holes is expected to be the strongest source of gravitational waves for LISA. Since these mergers take place in regions of extreme gravity, we need to solve Einstein's equations of general relativity on a computer in order to calculate these waveforms. For more than 30 years, scientists have tried to compute black hole mergers using the methods of numerical relativity. The resulting computer codes have been plagued by instabilities, causing them to crash well before the black holes in the binary could complete even a single orbit. Within the past few years, however, this situation has changed dramatically, with a series of remarkable breakthroughs. We will present the results of new simulations of black hole mergers with unequal masses and spins, focusing on the gravitational waves emitted and the accompanying astrophysical 'kicks.' The magnitude of these kicks has bearing on the production and growth of supermassive black holes during the epoch of structure formation, and on the retention of black holes in stellar clusters.
Author
Astrophysics; Black Holes (Astronomy); Gravitational Waves; Relativity; Simulation

20080030229 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MASSIM, the Milli-Arc-Second Structure Imager
Skinner, Gerry; March 31, 2008; 1 pp.; In English; HEAD 2008 Meeting, 31 Mar. - 3 Apr. 2008, Los Angeles, CA, USA
Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

The MASSIM (Milli-Arc-Second Structure Imager) mission will use a set of achromatic diffractive-refractive Fresnel lenses to achieve imaging in the X-ray band with unprecedented angular resolution. It has been proposed for study within the context of NASA's 'Astrophysics Strategic Mission Concept Studies' program. Lenses on an optics spacecraft will focus 5-11 keV X-rays onto detectors on a second spacecraft flying in formation 1000 km away. It will have a point-source sensitivity comparable with that of the current generation of major X-ray observatories (Chandra, XMM-Newton) but an angular resolution some three orders of magnitude better. MASSIM is optimized for the study of jets and other phenomena that occur in the immediate vicinity of black holes and neutron stars. It can also be used for studying other phenomena on the milli-arc-second scale, such as those involving proto-stars, the surfaces and surroundings of nearby active stars and interacting winds.
Author
Black Holes (Astronomy); Imaging Techniques; Fresnel Lenses; Neutron Stars; Refractivity; X Rays; Angular Resolution

20080030241 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Cyclotron Line Measurements with INTEGRAL
Pottschmidt, K.; Kreykenbohm, I.; Caballero, I.; Fritz, S.; Schoenherr, G.; Kretschmar, P.; Wilms, J.; McBride, V. A.; Suchy, S.; Rothschild, R. E.; March 31, 2008; 1 pp.; In English; INTEGRAL Session of the 10th HEAD Meeting, 31 Mar. - 3 Apr. 2008, Los Angeles, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Due to its broadband energy coverage, INTEGRAL has made important contributions to observing and interpreting cyclotron lines, which are present in the 10-100 keV range of a sample of accreting pulsars. In these systems photons with energies fulfilling the resonance condition inelastically Compton scatter off electrons quantized in the accretion column above the neutron star's magnetic pole(s). This process gives rise to the broad, absorption-like lines or 'cyclotron resonant scattering

features' (CRSF). The observed lines allow to directly measure the B-fields of these sources, resulting in values of a few times 1E12G. In this overview I will present recent highlights regarding CRSF observations as well as discuss current ideas and models for the physical conditions in the accretion column. Among the former are the stability of the spectrum of Vela X-1 during giant flares in 2003, the observation of three cyclotron lines during the 2004 outburst of V0332+53, the confirmation of the fundamental line at approximately 45 keV during a 2005 normal outburst of A0535-26, and the simultaneous detection of the two lines in the dipping source 4U 1907+09 (for which also a torque reversal was detected for the first time). Through these and other observations it has become increasingly apparent that two types of observations can potentially be used to constrain the accretion column geometry: the determination of energy ratios for multiple harmonic lines (only two sources with greater than 2 lines are known), was well as the evolution of the fundamental line centroid, which, for different sources, may or may not be correlated with flux. Furthermore, first steps have been taken away from the usual phenomenological description of the lines, towards a physical approach based on self-consistent CRSF modeling. Initial applications are presented.
Author
Cyclotrons; Line Spectra; Resonance Scattering; Astronomical Spectroscopy

20080030336 NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Axisymmetric, Hydrodynamical Model for the Torus Wind in Active Galactic Nuclei
Dorodnitsyn, A.; Kallman, T.; Proga, D.; [2008]; 4 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): 05-ATP05-18; Copyright; Avail.: Other Sources

We report on time-dependent axisymmetric simulations of an X-ray-excited flow from a parsec-scale, rotating, cold torus around an active galactic nucleus. Our simulations account for radiative heating and cooling and radiation pressure force. The simulations follow the development of a broad biconical outflow induced mainly by X-ray heating. We compute synthetic spectra predicted by our simulations. The wind characteristics and the spectra support the hypothesis that a rotationally supported torus can serve as the source of a wind which is responsible for the warm absorber gas observed in the X-ray spectra of many Seyfert galaxies.
Author
Active Galactic Nuclei; Seyfert Galaxies; Hydrodynamics; Toruses; Wind Velocity; X Ray Spectra

20080030360 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Astrophysics of the 21st Century - Exploring the Extreme Universe
Barbier, Louis M.; March 04, 2006; 1 pp.; In English; IEEE/AIAA Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; No Copyright; Avail.: Other Sources; Abstract Only

This paper will give an overview of the NASA Universe Division Beyond Einstein program. The Beyond Einstein program consists of a series of exploratory missions to investigate the most important and pressing problems in modern-day astrophysics - including searches for Dark Energy and studies of the earliest times in the universe, during the inflationary period after the Big Bang. A variety of new technologies are being developed both in the science instrumentation these missions will use and in the spacecraft that will carry those instruments.
Author
Astrophysics; Space Exploration; NASA Programs; Astronomical Observatories; Technology Assessment; Spacecraft Instruments

20080030368 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Discovery of a Neutron Star with Spin Frequency 530 Hz in A1744-361
Bhattacharyya, Sudip; Strohmayer, Tod E.; Markwardt, Craig B.; Swank, Jean H.; Bhattacharyya, Sudip; January 2005; 12 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

We report the detection with the Rossi X-ray Timing Explorer (RXTE) Proportional Counter Array (PCA) of 530 Hz burst oscillations in a thermonuclear (Type I) burst from the transient X-ray source A1744-361. This is only the second burst ever observed from this source, and the first to be seen in any detail. Our results confirm that A1744-361 is a low mass X-ray binary (LMXB) system harboring a rapidly rotating neutron star. The oscillations are first detected along the rising edge of the burst, and show evidence for frequency evolution of a magnitude similar to that seen in other burst sources. The modulation amplitude and its increase with photon energy are also typical of burst oscillations. The lack of any strong indication of photospheric radius expansion during the burst suggests a 9 kpc upper limit of the source distance. We also find energy dependent dips, establishing A1744-361 as a high inclination, dipping LMXB. The timescale between the two episodes of

observed dips suggests an orbital period of approx. 97 min. We have also detected a 2 - 4 Hz quasi-periodic-oscillation (QPO) for the first time from this source. This QPO appears consistent with approx. 1 Hz QPOs seen from other high inclination systems. We searched for kilohertz QPOs, and found a suggestive 2.3 sigma feature at 800 Hz in one observation. The frequency, strength and quality factor are consistent with that of a lower frequency kilohertz QPO, but the relatively low significance argues for caution, so we consider this a tentative detection requiring confirmation.
Author
Neutron Stars; X Ray Timing Explorer; Proportional Counters; Oscillations; Q Factors; X Ray Binaries; X Ray Sources

20080030784 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Synergy of Gamma-Ray Burst Detectors in the GLAST Era
Band, David; March 31, 2008; 1 pp.; In English; HEAD 2008 Conference, 31 Mar. - 3 Apr. 2008, Los Angeles, CA, USA
Contract(s)/Grant(s): NNGO6EO9OA; No Copyright; Avail.: Other Sources; Abstract Only

Simultaneous observations by the large number of gamma-ray burst detectors that will operate in the GLAST era will provide the spectra, lightcurves and locations necessary for studying burst physics and testing the putative relations between intrinsic burst properties. I review the burst detection sensitivities, spectral bands, and localization capabilities of the GLAST (GBM and LAT), Swift (BAT), INTEGRAL (ISGRI), Suzaku (wAM), AGILE (Super-AGILE) and wind (Konus) detectors; the detectors' energy band and the accumulation timescale of their trigger system affect their sensitivity to hard vs. soft and long vs. short bursts. In addition, I estimate the rate of simultaneous burst observations. In particular, coordination of the Swift observing plan consistent with Swift's other science objectives could increase the rate of GLAST bursts with redshifts
Author
Gamma Ray Bursts; Red Shift; Energy Bands; Spectral Bands; Actuators; Coordination

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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*.

20080026246 NASA Langley Research Center, Hampton, VA, USA
Thirty Years After: The Science of the Viking Program and the Discovery of a New Mars
Levine, Joel S.; [2006]; 8 pp.; In English
Contract(s)/Grant(s): WBS 069256.03.10.01.02; No Copyright; Avail.: CASI: A02, Hardcopy

Viking discovered a Mars that was very different from the Mars found by Mariner 4, 6 and 7. The new, exciting, more Earth-like Mars was hinted at by the Mariner 9 orbiter and confirmed by Viking. Viking discovered some very fundamental things about Mars. Viking discovered the presence of nitrogen in the atmosphere. A key ingredient needed for life. Viking made the first measurements of the isotopic composition of carbon, oxygen, nitrogen and the noble gases in the atmosphere of Mars. The ratio of 15N to 14N suggested that Mars may have lost more than 99% of the total mass of its atmosphere. The denser atmosphere in the past may explain the presence of flowing water earlier in the history of Mars first discovered by Mariner 9 with additional and higher spatial resolution examples provided by the Viking Orbiters. Viking did not measure organics or life at the surface of Mars. But, Viking did discover a surface unlike any other on the Solar System--a surface exhibiting very high chemical reactivity, most probably formed by the deposition of chemically active atmospheric gases, like hydrogen peroxide (H2O2) and ozone (O3), onto the surface of Mars.
Derived from text
Mars Atmosphere; Mars Surface; Mars (Planet); Mars Environment

20080026268 NASA Johnson Space Center, Houston, TX, USA
Chemistry and Mineralogy of Outcrops at Meridiani Planum
Clark, B. C.; Morris, R. V.; McLennan, S. M.; Gellert, R.; Jolliff, B.; Knoll, A. H.; Squyres, S. W.; Lowenstein, T. K.; Ming, D. W.; Tosca, N. J.; Yen, A,; Christensen, P. R.; Gorevan, S.; Brueckner, J.; Calvin, W.; Dreibus, G.; Farrand, W.; Klingelhoefer, G.; Waenke, H.; Zipfel, J.; Bell, J. F., III; Grotzinger, J.; McSween, H. Y.; Rieder, R.; Earth and Planetary Science Letters; [2005]; Volume 240, Issue 1, pp. 73-94; In English; Original contains color illustrations
Contract(s)/Grant(s): 361426.04.05; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.epsl.2005.09.040

Analyses of outcrops created by the impact craters Endurance, Fram and Eagle reveal the broad lateral continuity of

chemical sediments at the Meridiani Planum exploration site on Mars. Approximately ten mineralogical components are implied in these salt-rich silicic sediments, from measurements by instruments on the Opportunity rover. Compositional trends in an apparently intact vertical stratigraphic sequence at the Karatepe West ingress point at Endurance crater are consistent with non-uniform deposition or with subsequent migration of mobile salt components, dominated by sulfates of magnesium. Striking variations in Cl and enrichments of Br, combined with diversity in sulfate species, provide further evidence of episodes during which temperatures, pH, and water to rock ratios underwent significant change. To first order, the sedimentary sequence examined to date is consistent with a uniform reference composition, modified by movement of major sulfates upward and of minor chlorides downward. This reference composition has similarities to martian soils, supplemented by sulfate anion and the alteration products of mafic igneous minerals. Lesser cementation in lower stratigraphic units is reflected in decreased energies for grinding with the Rock Abrasion Tool. Survival of soluble salts in exposed outcrop is most easily explained by absence of episodes of liquid H2O in this region since the time of crater formation.
Author
Mars (Planet); Mars Exploration; Mars Surface; Outcrops; Sediments; Chemical Composition; Mineralogy; Mars Craters

20080026336 NASA Johnson Space Center, Houston, TX, USA
Nanophase Magnetite and Pyrrhotite in ALH84001 Martian Meteorite: Evidence for an Abiotic Origin
Golden, D. C.; Lauer, H. V., Jr. III; Ming, D. W.; Morris, R. V.; January 11, 2006; 2 pp.; In English; Nanoscale Processes in the Earth and Planetary, 11-13 Jan. 2006, New Mexico, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080026336

The nanophase magnetite crystals in the black rims of pancake-shaped carbonate globules of the Martian meteorite ALH84001 have been studied extensively because of the claim by McKay et al.that they are biogenic in origin. A subpopulation of these magnetite crystals are reported to conform to a unique elongated shape called 'truncated hexa-octahedral' or 'THO' by Thomas-Keprta et al. They claim these THO magnetite crystals can only be produced by living bacteria thus forming a biomarker in the meteorite. In contrast, thermal decomposition of Fe-rich carbonate has been suggested as an alternate hypothesis for the elongated magnetite formation in ALH84001 carbonates. The experimental and observational evidence for the inorganic formation of nanophase magnetite and pyrrhotite in ALH84001 by decomposition of Fe-rich carbonate in the presence of pyrite are provided.
Author (revised)
Meteorites; Magnetite; Pyrrhotite; Nanostructure (Characteristics); SNC Meteorites

20080026353 NASA Johnson Space Center, Houston, TX, USA
Isotope Variations in Terrestrial Carbonates and Thermal Springs as Biomarkers: Analogs for Martian Processes
Socki, Richard A.; Gibson, Everett K., Jr.; Bissada, K. K.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Stable isotope measurements of carbonate minerals contained within ALH84001 [1] suggest that fluids were present at 3.9 Gy on Mars [2, 3, 4, 5]. Both oxygen and carbon isotopes provide independent means of deciphering paleoenvironmental conditions at the time of carbonate mineral precipitation. In terrestrial carbonate rocks oxygen isotopes not only indicate the paleotemperature of the precipitating fluid, but also provide clues to environmental conditions that affected the fluid chemistry. Carbon isotopes, on the other hand, can indicate the presence or absence of organic compounds during precipitation (i.e. biogenically vs. thermogenically-generated methane), thus serving as a potential biomarker. We have undertaken a study of micro scale stable isotope variations measured in some terrestrial carbonates and the influence of organic compounds associated with the formation of these carbonates. Preliminary results indicate that isotope variations occur within narrow and discrete intervals, providing clues to paleoenvironmental conditions that include both biological and non-biological activity. These results carry implications for deciphering Martian isotope data and therefore potential biological prospecting on the planet Mars. Recently, Fourier Transform Spectrometer observations have detected methane occurring in the Martian atmosphere [6] that could be attributed to a possible biogenic source. Indeed, Mars Express has detected the presence of methane in the Martian atmosphere [7], with evidence indicating that methane abundances are greatest above those basins with high water concentrations.
Author
Biomarkers; Oxygen Isotopes; Organic Compounds; Carbon Isotopes; Minerals; Carbonates; Activity (Biology)

20080029296 NASA Johnson Space Center, Houston, TX, USA

Modeling Ellipsometry Measurements of Molecular Thin-Film Contamination on Genesis Array Samples

Calaway, Michael J.; Stansbery, E. K.; McNamara, K. M.; March 13, 2006; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080029296

The discovery of a molecular thin-film contamination on Genesis flown array samples changed the course of preliminary assessment strategies. Analytical techniques developed to measure solar wind elemental abundances must now compensate for a thin-film contamination. Currently, this is done either by experimental cleaning before analyses or by depth-profiling techniques that bypass the surface contamination. Inside Johnson Space Center s Genesis dedicated ISO Class 4 (Class 10) cleanroom laboratory, the selection of collector array fragments allocated for solar wind analyses are based on the documentation of overall surface quality, visible surface particle contamination greater than 1 m, and the amount of thin film contamination measured by spectroscopic ellipsometry. Documenting the exact thickness, surface topography, and chemical composition of these contaminates is also critical for developing accurate cleaning methods. However, the first step in characterization of the molecular film is to develop accurate ellipsometry models that will determine an accurate thickness measurement of the contamination film.

Derived from text

Contamination; Ellipsometry; Thin Films; Mathematical Models; Genesis Mission; Sampling

20080029300 NASA Johnson Space Center, Houston, TX, USA

Highly Siderophile Elements in Pallasites and Diogenites, Including the New Pallasite, CMS 04071

Danielson, L. R.; Humayun, M.; Righter, K.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Pallasites are long thought to represent a metallic core-silicate mantle boundary, where the IIIAB irons are linked to the crystallization history of the metallic fraction, and the HED meteorites may be linked to the silicate fraction. However, measurement of trace elements in individual metallic and silicate phases is necessary in order to fully under-stand the petrogenetic history of pallasites, as well as any magmatic processes which may link pallasites to both IIIAB irons and HED meteorites. In order to achieve this objective, abundances of a suite of elements were measured, including the highly siderophile elements (HSEs), in kamacite, taenite, troilite, schreibersite, chromite and olivine for the pallasites Admire, Imilac, Springwater, CMS 04071. In the diogenites GRO 95555, LAP 91900, and MET 00436, metal, sulfide, spinel, pyroxene, and silica were individually measured.

Derived from text

Siderophile Elements; Microanalysis; Trace Elements; Stony-Iron Meteorites; Geochemistry

20080029393 NASA Johnson Space Center, Houston, TX, USA

The Dos and Don'ts of how to Build a Planet, Using the Moon as an Example

Jones, J. H.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080029393

The bulk chemical compositions of planets may yield important clues concerning planetary origins. Failing that, bulk compositions are still important, in that they constrain calculation of planetary mineralogies and also constrain the petrogenesis of basaltic magmas. In the case of the Earth, there is little or no debate about the composition of the Earth's upper mantle. This is because our sample collections contain peridotitic xenoliths of that mantle. The most fertile of these are believed to have been little modified from their primary compositions. Using these samples and chondritic meteorites as a starting point, small perturbations on the compositions of existing samples allow useful reconstruction of the bulk silicate Earth (BSE). Elsewhere, I have argued that the next simplest case is the Eucrite Parent Body (EPB). Reconstructions based on Sc partitioning indicate that the EPB can be well approximated by a mixture of 20% eucrite and 80% equilibrium olivine. This leads to a parent body that is similar to CO (or devolatilized CM) chondrites. Partial melting experiments on CM chondrites confirm this model, because the residual solids in these experiments are dominated by olivine with minor pigonite [3]. The most difficult bodies to reconstruct are those that have undergone the most differentiation. Both the Moon and Mars may have passed through a magma ocean stage. In any event, lunar and martian basalts, unlike eucrites, were not derived from undifferentiated source regions. Reconstructions are primarily based on compositional trends within the basalts themselves with some critical assumptions: (i) Refractory lithophile elements (Ca, Al, REE, actinides) are presumed to be in chondritic

relative abundances; and (ii) some major element ratio is believed to exist in a chondritic ratio (e.g., Mg/Si, Mg/Al). The most commonly used parameter is Mg/Si.
Derived from text
Moon; Planetary Geology; Earth Mantle; Chemical Composition; Mineralogy

20080030098 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Jupiter Icy Moons Orbiter (JIMO): An Element of the Prometheus Program
October 15, 2004; 38 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001
Report No.(s): JPL Publication 04-16; 982-R06933; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030098

The Prometheus Program s Jupiter Icy Moons Orbiter (JIMO) Project is developing a revolutionary nuclear electric propulsion space system that would return scientific data from the icy Galilean satellites, Callisto, Ganymede, and Europa. This space system could also be used for future solar system exploration missions. Several major achievements occurred during Fiscal Year 2004 (FY 04). These include the addition of Department of Energy Naval Reactors (DOENR) and Northrop Grumman Space Technology (NGST) to the JIMO team, completion of the Science Definition Team s final report, generation of the Government and industry team trade studies and conceptual designs, and numerous technology demonstrations. The sections that follow detail these accomplishments.
Author
Galilean Satellites; Nuclear Electric Propulsion; Space Exploration; Project Planning; Mission Planning; Jupiter Probes

20080030137 NASA Goddard Space Flight Center, Greenbelt, MD, USA
MESSENGER'S First Flyby of Mercury
Slavin, James A.; [2008]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The MESSENGER mission to Mercury offers our first opportunity to explore this planet's miniature magnetosphere since Mariner 10's brief fly-bys in 1974-5. The magnetosphere of Mercury is the smallest in the solar system with its magnetic field typically standing off the solar wind only - 1000 to 2000 km above the surface. An overview of the MESSENGER mission and its January 14th close flyby of Mercury will be provided. Primary science objectives and the science instrumentation will be described. Initial results from MESSENGER'S first flyby on January 14th, 2008 will be discussed with an emphasis on the magnetic field and charged particle measurements.
Author
Messenger (Spacecraft); Flyby Missions; Mercury (Planet); Mercury Atmosphere; Planetary Magnetospheres

20080030142 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Energy Deposition Processes in Titan's Upper Atmosphere
Sittler, Edward C., Jr.; Bertucci, Cesar; Coates, Andrew; Cravens, Tom; Dandouras, Iannis; Shemansky, Don; July 07, 2008; 1 pp.; In English; Meeting held in Corpus Christi, TX on July 7-11, 2008; No Copyright; Avail.: Other Sources; Abstract Only

Most of Titan's atmospheric organic and nitrogen chemistry, aerosol formation, and atmospheric loss are driven from external energy sources such as Solar UV, Saturn's magnetosphere, solar wind and galactic cosmic rays. The Solar UV tends to dominate the energy input at lower altitudes of approximately 1100 km but which can extend down to approximately 400 km, while the plasma interaction from Saturn's magnetosphere, Saturn's magnetosheath or solar wind are more important at higher altitudes of approximately 1400 km, but the heavy ion plasma [O(+)] of approximately 2 keV and energetic ions [H(+)] of approximately 30 keV or higher from Saturn's magnetosphere can penetrate below 950km. Cosmic rays with energies of greater than 1 GeV can penetrate much deeper into Titan's atmosphere with most of its energy deposited at approximately 100 km altitude. The haze layer tends to dominate between 100 km and 300 km. The induced magnetic field from Titan's interaction with the external plasma can be very complex and will tend to channel the flow of energy into Titan's upper atmosphere. Cassini observations combined with advanced hybrid simulations of the plasma interaction with Titan's upper atmosphere show significant changes in the character of the interaction with Saturn local time at Titan's orbit where the magnetosphere displays large and systematic changes with local time. The external solar wind can also drive sub-storms within the magnetosphere which can then modify the magnetospheric interaction with Titan. Another important parameter is solar zenith angle (SZA) with respect to the co-rotation direction of the magnetospheric flow. Titan's interaction can contribute to atmospheric loss via pickup ion loss, scavenging of Titan's ionospheric plasma, loss of ionospheric plasma down its induced

magnetotail via an ionospheric wind, and non-thermal loss of the atmosphere via heating and sputtering induced by the bombardment of magnetospheric keV ions and electrons. This energy input evidently drives the large positive and negative ions observed below approximately 1100 km altitude with ion masses exceeding 10,000 daltons. We refer to these ions as seed particles for the aerosols observed below 300 km altitude. These seed particles can be formed, for example, from the polymerization of acetylene (C2H2) and benzene (C6H6) molecules in Titan's upper atmosphere to form polycyclic aromatic hydrocarbons (PAH) and/or fullerenes (C60). In the case of fullerenes, which are hollow spherical carbon shells, magnetospheric keV [O(+)] ions can become trapped inside the fullerenes and eventually find themselves inside the aerosols as free oxygen. The aerosols are then expected to fall to Titan's surface as polymerized hydrocarbons with trapped free oxygen where unknown surface chemistry can take place.
Author
Titan; Upper Atmosphere; Energy Transfer; Deposition; Planetary Atmospheres; Atmospheric Energy Sources; Magnetic Fields; Atmospheric Chemistry

20080030170 NASA Johnson Space Center, Houston, TX, USA
Mn-53-Cr-53 Systematics of R-Chondrite NWA 753
Jogo, K.; Shih, C-Y.; Reese, Y. D.; Nyquist, L. E.; March 13, 2006; 2 pp.; In English; Lunar and Planetary Science Conference, 13-17 mar. 2006, League City, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 344-31; Copyright; Avail.: CASI: A01, Hardcopy

Chondrules and chondrites are interpreted as objects formed in the early solar system, and it is important to study them in order to elucidate its evolution. Here, we report the study of the Mn-Cr systematics of the R-Chondrite NWA753 and compare the results to other chondrite data. The goal was to determine Cr isotopic and age variations among chondrite groups with different O-isotope signatures. The Mn-53-Cr-53 method as applied to individual chondrules [1] or bulk chondrites [2] is based on the assumption that 53Mn was initially homogeneously distributed in that portion the solar nebula where the chondrules and/or chondrites formed. However, different groups of chondrites formed from regions of different O-isotope compositions. So, different types of chondrites also may have had different initial Mn-53 abundances and/or Cr isotopic compositions. Thus, it is important to determine the Cr isotopic systematics among chondrites from various chondrite groups. We are studying CO-chondrite ALH83108 and Tagish Lake in addition to R-Chondrite NWA753. These meteorites have very distinct O-isotope compositions (Figure 1).
Author
Chondrites; Meteoritic Composition; Isotopic Labeling; Manganese Isotopes; Solar Nebula

20080030239 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Observing Exoplanetary Ozone In The Mid-Ultraviolet
Heap, S.; February 23, 2008; 1 pp.; In English; International Astronomy Meeting, 23 Feb. - 1 Mar. 2008, Grenoble, France; No Copyright; Avail.: Other Sources; Abstract Only

There are good reasons for pushing the spectral range of observation to shorter wavelengths than currently envisaged for terrestrial planet-finding missions utilizing with a 4-rn, diffraction-limited, optical telescope: (1) The angular resolution is higher, so that the image of an exoplanet is better separated from that of the much brighter star. (2) Due to the higher resolution, the exozodiacal background per resolution element is smaller, so exposure times are reduced for the same incident flux. (3) Most importantly, the sensitivity to the presence of life on habitable exoplanets is increased by a hundred-fold by access to the ozone biomarker at 250-300 nm. These benefits must be weighed against challenges arising from the faintness of exoplanets in the mid-UV. We will describe the benefits and the technical and cost challenges.
Author
Extrasolar Planets; Ozone; Terrestrial Planets; Ultraviolet Radiation

20080030349 NASA Johnson Space Center, Houston, TX, USA
The Incredible Diversity of Fe-bearing Phases at Gusev Crater, Mars, According to the Mars Exploration Rover Moessbauer Spectrometer
Morris, R. V.; Klingelhoefer, G.; Schroeder, C.; Rodionov, D. S.; Ming, D. W.; Yen, A.; June 07, 2006; 2 pp.; In English; Sixth Workshop on Mossbauer Spectroscopy, 7-11 Jun. 2006, Seeheim, Germany; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Mars Exploration Rover (MER) Spirit landed on the plains of Gusev Crater on 4 January 2004. One primary scientific objective for the mission is to characterize the mineralogical and elemental composition of surface materials, searching for

evidence of water and clues for assessing past and current climates and their suitability for life [1]. The role of the Moessbauer (MB) spectrometer on Spirit is to provide quantitative information about the distribution of Fe among its oxidation and coordination states, identification of Fe-bearing phases, and relative distribution of Fe among those phases. The speciation and distribution of Fe in Martian rock and soil constrains the primary rock types, redox conditions under which primary minerals crystallized, the extent of alteration and weathering, the type of alteration and weathering products, and the processes and environmental conditions for alteration and weathering. In this abstract, we discuss the incredible diversity of Fe-bearing phases detected by Spirit s MB instrument during its first 540 sols of exploration at Gusev crater [2,3].
Author
Mars Roving Vehicles; Surface Properties; Mars Landing Sites; Mineralogy; Iron; Oxidation-Reduction Reactions; Soils; Chemical Composition; Mars Craters

20080030352 NASA Johnson Space Center, Houston, TX, USA
Suited for Space
Kosmo, Joseph J.; February 06, 2006; 28 pp.; In English; Conference on Hab. Research and Tech. Development, 6-8 Feb. 2006, Orlando, FL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030352

This viewgraph presentation describes the basic functions of space suits for EVA astronauts. Space suits are also described from the past, present and future space missions. The contents include: 1) Why Do You Need A Space Suit?; 2) Generic EVA System Requirements; 3) Apollo Lunar Surface Cycling Certification; 4) EVA Operating Cycles for Mars Surface Missions; 5) Mars Surface EVA Mission Cycle Requirements; 6) Robustness Durability Requirements Comparison; 7) Carry-Weight Capabilities; 8) EVA System Challenges (Mars); 9) Human Planetary Surface Exploration Experience; 10) NASA Johnson Space Center Planetary Analog Activities; 11) Why Perform Remote Field Tests; and 12) Other Reasons Why We Perform Remote Field Tests.
CASI
Extravehicular Activity; Space Missions; Space Suits; Astronauts; NASA Space Programs; Planetary Surfaces

20080030795 NASA Glenn Research Center, Cleveland, OH, USA
The Need for High Fidelity Lunar Regolith Simulants
Gaier, James R.; June 2008; 17 pp.; In English; Space Resources Roundtable IX, 25-27 Oct. 2008, Golden, CO, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 936374.03.03.03
Report No.(s): NASA/TM-2008-215261; E-16528; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030795

The case is made for the need to have high fidelity lunar regolith simulants to verify the performance of structures, mechanisms, and processes to be used on the lunar surface. Minor constituents will in some cases have major consequences. Small amounts of sulfur in the regolith can poison catalysts, and metallic iron on the surface of nano-sized dust particles may cause a dramatic increase in its toxicity. So the definition of a high fidelity simulant is application-dependent. For example, in situ resource utilization will require high fidelity in chemistry, meaning careful attention to the minor components and phases; but some other applications, such as the abrasive effects on suit fabrics, might be relatively insensitive to minor component chemistry while abrasion of some metal components may be highly dependent on trace components. The lunar environment itself will change the surface chemistry of the simulant, so to have a high fidelity simulant it must be used in a high fidelity simulated environment to get an accurate simulation. Research must be conducted to determine how sensitive technologies will be to minor components and environmental factors before they can be dismissed as unimportant.
Author
Lunar Environment; Lunar Rocks; Lunar Surface; Surface Reactions; Abrasion; Chemical Reactions; Dust

20080030933 NASA Johnson Space Center, Houston, TX, USA
Partitioning of Ni, Co and V between Spinel-Structured Oxides and Silicate Melts: Importance of Spinel Composition
Righter, K.; Leeman, W. P.; Hervig, R. L.; March 2006; 25 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NSF EAR-0074036; NSF EAR-0003612; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://dx.doi.org/10.1016/j.chemgeo.2005.05.011

Partitioning of Ni, Co and V between Cr-rich spinels and basaltic melt has been studied experimentally between 1150 and

1325 C, and at controlled oxygen fugacity from the Co-CoO buffer to slightly above the hematite magnetite buffer. These new results, together with new Ni, Co and V analyses of experimental run products from Leeman [Leeman, W.P., 1974. Experimental determination of the partitioning of divalent cations between olivine and basaltic liquid, Pt. II. PhD thesis, Univ. Oregon, 231 - 337.], show that experimentally determined spinel melt partition coefficients (D) are dependent upon temperature (T), oxygen fugacity (fO2) and spinel composition. In particular, partition coefficients determined on doped systems are higher than those in natural (undoped) systems, perhaps due to changing activity coefficients over the composition range defined by the experimental data. Using our new results and published runs (n =85), we obtain a multilinear regression equation that predicts experimental D(V) values as a function of T, fO2, concentration of V in melt and spinel composition. This equation allows prediction of D(V) spinel/melt values for natural mafic liquids at relevant crystallization conditions. Similarly, D(Ni) and D(Co) values can be inferred from our experiments at redox conditions approaching the QFM buffer, temperatures of 1150 to 1250 C and spinel composition (early Cr-bearing and later Ti-magnetite) appropriate for basic magma differentiation. When coupled with major element modelling of liquid lines of descent, these values (D(Ni) sp/melt=10 and D(Co) sp/melt=5) closely reproduce the compositional variation observed in komatiite, mid-ocean ridge basalt (MORB), ocean island basalt (OIB) and basalt to rhyolite suites.
Author
Basalt; Melts (Crystal Growth); Oxides; Silicates; Spinel; Nickel; Cobalt; Vanadium

20080030934 NASA Johnson Space Center, Houston, TX, USA
Planetary Dust: Cross-Functional Considerations
Wagner, Sandra; February 06, 2006; 18 pp.; In English; Habitation 2006, 5-8 Feb. 2006, Orlando, FL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20080030934

Apollo astronauts learned first hand how problems with dust impact lunar surface missions. After three days, lunar dust contaminating on EVA suit bearings led to such great difficulty in movement that another EVA would not have been possible. Dust clinging to EVA suits was transported into the Lunar Module. During the return trip to Earth, when microgravity was reestablished, the dust became airborne and floated through the cabin. Crews inhaled the dust and it irritated their eyes. Some mechanical systems aboard the spacecraft were damaged due to dust contamination. Study results obtained by Robotic Martian missions indicate that Martian surface soil is oxidative and reactive. Exposures to the reactive Martian dust will pose an even greater concern to the crew health and the integrity of the mechanical systems. As NASA embarks on planetary surface missions to support its Exploration Vision, the effects of these extraterrestrial dusts must be well understood and systems must be designed to operate reliably and protect the crew in the dusty environments of the Moon and Mars. The AIM Dust Assessment Team was tasked to identify systems that will be affected by the respective dust, how they will be affected, associated risks of dust exposure, requirements that will need to be developed, identified knowledge gaps, and recommended scientific measurements to obtain information needed to develop requirements, and design and manufacture the surface systems that will support crew habitation in the lunar and Martian outposts.
Author
Extravehicular Activity; Lunar Dust; Space Suits; Planetary Environments; Mars Surface

20080030951 New Mexico Univ., Albuquerque, NM, USA; NASA Johnson Space Center, Houston, TX, USA
Oxygen Fugacity of the Upper Mantle of Mars. Evidence from the Partitioning Behavior of Vanadium in Y980459 (Y98) and other Olivine-Phyric Shergottites
Shearer, C. K.; McKay, G. A.; Papike, J. J.; Karner, J.; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Using partitioning behavior of V between olivine and basaltic liquid precisely calibrated for martian basalts, we determined the redox state of primitive (olivine-rich, high Mg#) martian basalts near their liquidus. The combination of oxidation state and incompatible element characteristics determined from early olivine indicates that correlations between fO2 and other geochemical characteristics observed in many martian basalts is also a fundamental characteristic of these primitive magmas. However, our data does not exhibit the range of fO2 observed in these previous studies.. We conclude that the fO2 for the martian upper mantle is approximately IW+1 and is incompatible-element depleted. It seems most likely (although clearly open to interpretation) that these mantle-derived magmas assimilated a more oxidizing (>IW+3), incompatible-element enriched, lower crustal component as they ponded at the base of the martian crust.
Derived from text
Geochemistry; Mars (Planet); Mars Surface; Olivine; Planetary Crusts; Shergottites; Vanadium

20080030959 NASA Johnson Space Center, Houston, TX, USA
Antarctic Meteorite Newsletter, Volume 28, Number 2
Righter, Kevin, Editor; Satterwhite, Cecilia, Editor; August 2005; 1 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: Other Sources; Abstract Only

This newsletter contains classifications for 274 new meteorites from the 2003 and 2004 ANtarctic Search for METeorites (ANSMET) collections. They include samples from the Cumulus Hills, Larkman Nunatak, LaPaz Ice Field, MacAlpine Hills, Dominion Range, Miller Range, Roberts Massif, and Sandford Cliffs. Tables are provided of the newly classified Antarctic meteorites, meteorites classified by type, and tentative pairings petrographic descriptions.
Derived from text
Meteorites; Antarctic Regions

20080030960 Curtin Univ. of Technology, Bentley, Australia; NASA Johnson Space Center, Houston, TX, USA
U-Pb Ages of Lunar Apatites
Vaughan, J.; Nemchin, A. A.; Pidgeon, R. T.; Meyer, Charles; March 13, 2006; 2 pp.; In English; 37th Lunar and Planetary Science Conference, 13-17 Mar. 2006, League City, TX, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Apatite is one of the minerals that is rarely utilized in U-Pb geochronology, compared to some other U-rich accessory phases. Relatively low U concentration, commonly high proportion of common Pb and low closure temperature of U-Pb system of apatite inhibit its application as geochronological tool when other minerals such as zircon are widely available. However, zircon appear to be restricted to certain type of lunar rocks, carrying so called KREEP signature, whereas apatite (and whitlockite) is a common accessory mineral in the lunar samples. Therefore, utilizing apatite for lunar chronology may increase the pool of rocks that are available for U-Pb dating. The low stability of U-Pb systematics of apatite may also result in the resetting of the system during meteoritic bombardment, in which case apatite may provide an additional tool for the study of the impact history of the Moon. In order to investigate these possibilities, we have analysed apatites and zircons from two breccia samples collected during the Apollo 14 mission. Both samples were collected within the Fra Mauro formation, which is interpreted as a material ejected during the impact that formed the Imbrium Basin.
Derived from text
Geochronology; Lunar Geology; Uranium; Calcium Phosphates; Mineralogy; Lead (Metal)

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20080026250 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Magnetic Field in the Outer Heliosphere
Smith, Edward J.; American Institute of Physics Conference Proceedings; September 15, 2004; Volume 719, pp. 213-220; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1063/1.1809520; http://hdl.handle.net/2014/40837

Observed properties of the magnetic field in the outer heliosphere are generally well described by the Parker model but evidence has accumulated of significant departures in the components and field magnitude. The radial component is independent of solar latitude at both solar minimum and maximum implying non-radial solar wind flow near the Sun driven by differential magnetic pressure. The azimuthal component deviates from the Parker values at high latitudes as a result of the non-radial flow near the Sun that causes fields to originate at higher latitudes than those at which they are observed far from the Sun. A turning of the spiral angle toward the radial direction by tens of degrees is often observed inside co-rotating rarefaction regions (dwells). A recent model attributes this effect to a motion of the field across polar coronal hole boundaries that results in different solar wind speeds along parts of the field line. The north-south component can depart from zero for many days as a result of the tilting of the interface between fast and slow streams. Recent Voyager observations show that, during solar minimum, the field magnitude is smaller than extrapolations outward from 1 AU. This ‘flux deficit,’ seen earlier in Pioneer data, may be explained by any of several physical models.
Author
Heliosphere; Solar Activity Effects; Solar Wind; Sun; Solar Magnetic Field

20080030106 NASA Marshall Space Flight Center, Huntsville, AL, USA

On the Relationship between Solar Wind Speed, Earthward-Directed Coronal Mass Ejections, Geomagnetic Activity, and the Sunspot Cycle Using 12-Month Moving Averages

Wilson, Robert M.; Hathaway, David H.; June 2008; 94 pp.; In English; Original contains black and white illustrations

Report No.(s): NASA/TP-2008-215413; M-1233; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/2060/20080030106

For 1996 .2006 (cycle 23), 12-month moving averages of the aa geomagnetic index strongly correlate (r = 0.92) with 12-month moving averages of solar wind speed, and 12-month moving averages of the number of coronal mass ejections (CMEs) (halo and partial halo events) strongly correlate (r = 0.87) with 12-month moving averages of sunspot number. In particular, the minimum (15.8, September/October 1997) and maximum (38.0, August 2003) values of the aa geomagnetic index occur simultaneously with the minimum (376 km/s) and maximum (547 km/s) solar wind speeds, both being strongly correlated with the following recurrent component (due to high-speed streams). The large peak of aa geomagnetic activity in cycle 23, the largest on record, spans the interval late 2002 to mid 2004 and is associated with a decreased number of halo and partial halo CMEs, whereas the smaller secondary peak of early 2005 seems to be associated with a slight rebound in the number of halo and partial halo CMEs. Based on the observed aaM during the declining portion of cycle 23, RM for cycle 24 is predicted to be larger than average, being about 168+/-60 (the 90% prediction interval), whereas based on the expected aam for cycle 24 (greater than or equal to 14.6), RM for cycle 24 should measure greater than or equal to 118+/-30, yielding an overlap of about 128+/-20.

Author

Sunspots; Sunspot Cycle; Coronal Mass Ejection; Solar Wind; Wind Velocity; Halos

20080030140 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Magnetofluid Turbulence in the Solar Wind

Goldstein, Melvyn L.; July 08, 2008; 1 pp.; In English; Princeton University 2008 General Meeting, 8-10 Jul. 2008, Princeton, NJ, USA; No Copyright; Avail.: Other Sources; Abstract Only

The solar wind shows striking characteristics that suggest that it is a turbulent magnetofluid, but the picture is not altogether simple. From the earliest observations, a strong correlation between magnetic fluctuations and plasma velocity fluctuations was noted. The high corrections suggest that the fluctuations are Alfven waves. In addition, the power spectrum of the magnetic fluctuation showed evidence of an inertial range that resembled that seen in fully-developed fluid turbulence. Alfven waves, however, are exact solutions of the equations of incompressible magnetohydrodynamics. Thus, there was a puzzle: how can a magnetofluid consisting of Alfven waves be turbulent? The answer lay in the role of velocity shears in the solar wind that could drive turbulent evolution. Puzzles remain: for example, the power spectrum of the velocity fluctuations is less steep than the slope of the magnetic fluctuations, nor do we understand even now why the solar wind appears to be nearly incompressible with a -5/3 power-spectral index.

Author

Solar Wind; Magnetohydrodynamic Turbulence

20080030143 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Simulations of Solar Wind Turbulence

Goldstein, Melvyn L.; Usmanov, A. V.; Roberts, D. A.; June 07, 2008; 1 pp.; In English; Dynamical Processes in Space Plasmas, 7-14 Jun. 2008, Saint Johns, USA; Copyright; Avail.: Other Sources; Abstract Only

Recently we have restructured our approach to simulating magnetohydrodynamic (MHD) turbulence in the solar wind. Previously, we had defined a 'virtual' heliosphere that contained, for example, a tilted rotating current sheet, microstreams, quasi-two-dimensional fluctuations as well as Alfven waves. In this new version of the code, we use the global, time-stationary, WKB Alfven wave-driven solar wind model developed by Usmanov and described in Usmanov and Goldstein [2003] to define the initial state of the system. Consequently, current sheets, and fast and slow streams are computed self-consistently from an inner, photospheric, boundary. To this steady-state configuration, we add fluctuations close to, but above, the surface where the flow become super-Alfvenic. The time-dependent MHD equations are then solved using a semi-discrete third-order Central Weighted Essentially Non-Oscillatory (CWENO) numerical scheme. The computational domain now includes the entire sphere; the geometrical singularity at the poles is removed using the multiple grid approach described in Usmanov [1996]. Wave packets are introduced at the inner boundary such as to satisfy Faraday's Law [Yeh and Dryer, 1985] and their nonlinear evolution are followed in time.

Author

Solar Wind; Magnetohydrodynamic Turbulence; Magnetohydrodynamic Simulation

20080030144 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Measuring the Electron Temperature in the Corona

Davila, Joseph; SaintCyr, Orville C.; Reginald, Nelson; April 07, 2008; 1 pp.; In English; USAF Workshop, 7-11 Apr. 2008, Alamorgordo,NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

We report on an experiment to demonstrate the feasibility of a new method to obtain the electron temperature and flow speed in the solar corona by observing the visible Kcoronal spectrum during the total solar eclipse on 29 March 2006 in Libya. Results show that this new method is indeed feasible, giving electron temperatures and speeds of 1.10 $\pm$ 0.05 MK, 103.0 $\pm$ 92.0 $kmsA{-l}$; 0.98 $\pm$ 0.12 MK, 0.0 + 10.0 $kmsA{-1)s; 0.70 $\pm$ 0.08 MK, 0.0 + 10.0 $kmsA{-l)$ at l.l{\it R)$ {\odot}$ in the solar north, east and west, respectively, and 0.93 $\pm$ 0.12 MK, 0.0 + 10.0 $kmsA{-l}$ at 1.2{\it R}$ {\odot}$ in the solar east. This new technique could be easily used from a space-based platform in a coronagraph to produce two dimensional maps of the electron temperature and bulk flow speed at the base of the solar wind useful for the study of heliospheric structure and space weather.

Author

Temperature Measurement; Electron Energy; Solar Corona; Solar Wind; Space Weather; Thermal Mapping

20080030145 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Explaining Warm Coronal Loops

Klimchuk, James A.; Karpen, Judy T.; Patsourakos, Spiros; May 25, 2008; 1 pp.; In English; Joint meeting of AAS/SPD and American Geophysics Union (AGU), 25-31 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

One of the great mysteries of coronal physics that has come to light in the last few years is the discovery that warn (- 1 INK) coronal loops are much denser than expected for quasi-static equilibrium. Both the excess densities and relatively long lifetimes of the loops can be explained with bundles of unresolved strands that are heated impulsively to very high temperatures. Since neighboring strands are at different stages of cooling, the composite loop bundle is multi-thermal, with the distribution of temperatures depending on the details of the 'nanoflare storm.' Emission hotter than 2 MK is predicted, but it is not clear that such emission is always observed. We consider two possible explanations for the existence of over-dense warm loops without corresponding hot emission: (1) loops are bundles of nanoflare heated strands, but a significant fraction of the nanoflare energy takes the form of a nonthermal electron beam rather then direct plasma heating; (2) loops are bundles of strands that undergo thermal nonequilibrium that results when steady heating is sufficiently concentrated near the footpoints. We present numerical hydro simulations of both of these possibilities and explore the observational consequences, including the production of hard X-ray emission and absorption by cool material in the corona.

Author

Coronal Loops; Plasma Heating; High Temperature; Electron Beams; Emission

20080030207 NASA Goddard Space Flight Center, Greenbelt, MD, USA

EUNIS Underflight Calibrations of CDS, EIT, TRACE, EIS, and EUVI

Thomas, Roger J.; Wang, Tongjiang; Rabin, Douglas M.; Jess, David B.; May 26, 2008; 1 pp.; In English; Meeting of the Americas 2008 Joint Assembly (AGU/SPD-AAS), 26-31 May 2008, Fort Lauderdale, Fl, USA; Copyright; Avail.: Other Sources; Abstract Only

The Extreme-Ultraviolet Normal-Incidence Spectrograph (EUNIS) is a sounding rocket instrument that obtains imaged high-resolution solar spectra. It has now had two successful flights, on 2006 April 12 and 2007 November 16, providing data to support underflight calibrations for a number of orbiting solar experiments on both occasions. A regular part of each campaign is the end-to-end radiometric calibration of the rocket payload carried out at RAL in the UK, using the same facility that provided pre-flight CDS and EIS calibrations. The measurements, traceable to primary radiometric standards, can establish the absolute EUNIS response within a total uncertainty of 10% over its full longwave bandpass of 300-370A. During each EUNIS flight, coordinated observations are made of overlapping solar locations by all participating space experiments, and identified by subsequent image co-registrations, allowing the EUNIS calibrations to be applied to these other instruments as well. The calibration transfer is straightforward for wavelengths within the EUNIS LW bandpass, and is extended to other wavelengths by means of a series of temperature- and density-insensitive line-ratios, with one line of each pair in the calibrated band and the other in the transfer band. In this way, the EUNIS-06 flight is able to update the radiometric calibrations of CDS NISl (and 2nd-order NIS2 near 2x304A), all four channels of EIT, and the three EUV channels of TRACE. The EUNIS-07 flight will further update those missions, as well as both channels of Hinode/EIS and all four channels of STEREO/SECCHI/EUVI. Future EUNIS flights have been proposed that will continue this underflight calibration service. EUNIS is supported

by the NASA Heliophysics Division through its Low Cost Access to Space Program in Solar and Heliospheric Physics.
Author
Extreme Ultraviolet Radiation; Spaceborne Experiments; Sounding Rockets; Radiometers; Solar Spectra; Spectrographs; Solar Physics

20080030210 NASA Goddard Space Flight Center, Greenbelt, MD, USA
EUNIS Underflight Calibrations of CDS, EIT, TRACE, EIS, and EUVI
Thomas, Roger J.; Rabin, Douglas M.; Jess, David B.; Wang, Tongjiang; March 30, 2008; 1 pp.; In English; National Astronomy Meeting 2008, 30 Mar. - 6 Apr. 2008, Belfast, Ireland; No Copyright; Avail.: Other Sources; Abstract Only

The Extreme-Ultraviolet Normal-Incidence Spectrograph (EUNIS) is a sounding rocket instrument that obtains imaged high-resolution solar spectra. It has now had two successful flights, on 2006 April 12 and 2007 November 16, providing data to support underflight calibrations for a number of orbiting solar experiments on both occasions. A regular part of each campaign is the end-to-end radiometric calibration of the rocket payload carried out at RAL in the UK, using the same facility that provided pre-flight CDS and EIS calibrations. The measurements, traceable to primary radiometric standards, can establish the absolute EUNIS response within a relative uncertainty of 10% over its full longwave bandpass of 300-370A. During each EUNIS flight, coordinated observations are made of overlapping solar locations by all participating space experiments, and identified by subsequent image co-registrations, allowing the EUNIS calibrations to be applied to these other instruments as well. The calibration transfer is straightforward for wavelengths within the EUNIS LW bandpass, and is extended to other wavelengths by means of a series of 'insensitive' line-ratios, with one line of each pair in the calibrated band and the other in the transfer band. In this way, the EUNIS-06 flight is able to update the radiometric calibrations of CDS NISl (plus 2nd order NIS2 near 2x304A), all four channels of EIT, and the three EUV channels of TRACE. The EUNIS-07 flight will further update those missions, as well as both channels of Hinode/EIT and all four channels of STEREO/SECCHI/EUVI. Future EUNIS flights have been proposed that will continue this underflight calibration service. EUNIS is supported by the NASA Heliophysics Division through its Low Cost Access to Space Program in Solar and Heliospheric Physics.
Author
Sounding Rockets; Spaceborne Experiments; Extreme Ultraviolet Radiation; High Resolution; Calibrating; Heliosphere; Solar Physics; Spectrographs

20080030281 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Development of Time-Distance Helioseismology Data Analysis Pipeline for SDO/HMI
DuVall, T. L., Jr.; Zhao, J.; Couvidat, S.; Parchevsky, K. V.; Beck, J.; Kosovichev, A. G.; Scherrer, P. H.; May 26, 2008; 1 pp.; In English; Joint Assembly of the AAS/SPD and AGU Meeting, 26-30 May 2008, Fort Lauderdale, FL, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Helioseismic and Magnetic Imager of SDO will provide uninterrupted 4k x 4k-pixel Doppler-shift images of the Sun with approximately 40 sec cadence. These data will have a unique potential for advancing local helioseismic diagnostics of the Sun's interior structure and dynamics. They will help to understand the basic mechanisms of solar activity and develop predictive capabilities for NASA's Living with a Star program. Because of the tremendous amount of data the HMI team is developing a data analysis pipeline, which will provide maps of subsurface flows and sound-speed distributions inferred form the Doppler data by the time-distance technique. We discuss the development plan, methods, and algorithms, and present the status of the pipeline, testing results and examples of the data products.
Author (revised)
Helioseismology; Data Acquisition; Data Processing; Imaging Techniques; Time Measurement; Doppler Effect

20080030283 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Still Virtual After All These Years: Recent Developments in the Virtual Solar Observatory
Gutman, Joseph B.; Bogart; Davey; Hill; Masters; Zarro; May 27, 2008; 1 pp.; In English; American Geophysical Union, (AGU) Solar Physics Division (SPD) meeting to attend co-chair SOHO Science Working Team (SWT) meeting, 27-30 May 2008, Fort Lauderdale, Fl, USA; Copyright; Avail.: Other Sources; Abstract Only

While continuing to add access to data from new missions, including Hinode and STEREO, the Virtual Solar Observatory is also being enhanced as a research tool by the addition of new features such as the unified representation of catalogs and event lists (to allow joined searches in two or more catalogs) and workable representation and manipulation of large numbers of search results (as are expected from the Solar Dynamics Observatory database). Working with our RHESSI colleagues, we

have also been able to improve the performance of IDL-callable vso_search and vso_get functions, to the point that use of those routines is a practical alternative to reproducing large subsets of mission data on one's own LAN.
Author
Solar Observatories; Data Bases; Information Retrieval; Technology Assessment

20080030289 NASA Goddard Space Flight Center, Greenbelt, MD, USA
CME Initiation
Antiochos, Spiro K.; September 28, 2008; 1 pp.; In English; Second Hinode Science meeting, 28 Sep. - 4 Oct. 2008, Boulder, CO, USA; No Copyright; Avail.: Other Sources; Abstract Only

One of the most challenging problems in solar physics is understanding the processes responsible for giant magnetic disruptions such as the event of July 14, 2000, which consisted of a massive filament ejection, a fast coronal mass ejection (CME), prolonged X-class flaring, and an intense particle storm. These major events are of critical importance because they drive the most destructive forms of space weather and they provide a unique opportunity to study, in revealing detail, MHD instability and nonequilibrium -- processes that are at the heart of plasma astrophysics. It is now widely accepted that CMEs/eruptive flares represent the explosive release of magnetic energy stored in the corona. Therefore, in order to understand the phenomenon, we must answer the following questions: What is the field structure responsible for the disruption and why is the energy released explosively? In this talk we address these two questions using the latest theories and numerical models for CMEs/eruptive flares.
Author
Magnetohydrodynamic Stability; Coronal Mass Ejection; Plasmas (Physics); Ejection; Disrupting; Coronas; Astrophysics; Destruction; Solar Physics

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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*.

20080026341 NASA Johnson Space Center, Houston, TX, USA
Comparisons of Integrated Radiation Transport Models with Microdosimetry Data in Spaceflight
Cucinotta, Francis A.; Nikjoo, H.; Kim, M. Y.; Hu, X.; Dicello, J. F.; Pisacane, V. L.; [2006]; 2 pp.; In English; Tenth Symposium on Neutron Dosimety, 12-16 Jun. 2006, Uppsala, Sweden; Copyright; Avail.: Other Sources; Abstract Only

Astronauts are exposed to galactic cosmic rays (GCR), trapped protons, and possible solar particle events (SPE) during spaceflight. For such complicated mixtures of radiation types and kinetic energies, tissue equivalent proportional counters (TEPC's) represent a simple time-dependent approach for radiation monitoring. Of interest in radiation protection is the average quality factor of a radiation field defined as a function of linear energy transfer, LET, Q(sub ave)(LET). However TEPC's measure the average quality factors as a function of lineal energy (y), Q(sub ave)(y) defined as the average energy deposition in a volume divided by the average chord length of the volume. Lineal energy, y deviates from LET due to energy straggling, delta-ray escape or entry, and nuclear fragments produced in the detector. Using integrated space radiation models that includes the transport code HZETRN/BRYNTRN, the quantum nuclear interaction model, QMSFRG, and results from Monte-Carlo track simulations of TEPC's response to ions, we consider comparisons of model calculations to TEPC results from NASA missions in low Earth orbit and make predictions for lunar and Mars missions. Good agreement between the model and measured spectra from past NASA missions is found. A finding of this work is that TEPC's values for trapped or solar protons of Q(sub ave)(y) range from 1.9-2.5, overestimating Q(sub ave)(LET), which ranges from 1.4-1.6 with both quantities increasing with shielding depth due to nuclear secondaries Comparisons for the complete GCR spectra show that Q(sub ave)(LET) for GCR is approximately 3.5-4.5, while TEPC's measure 2.9-3.4 for Q(sub ave)(y) with the GCR values decreasing with depth as heavy ions are absorbed in shielding material. Our results support the use of TEPC's for space radiation environmental monitoring when computational analysis is used for proper data interpretation.
Author
Radiation Transport; Dosimeters; Data Acquisition; Data Processing; Proportional Counters; Tissues (Biology); Models; Environmental Monitoring; Extraterrestrial Radiation

20080029284 NASA Johnson Space Center, Houston, TX, USA

Cancer Risk from Exposure to Galactic Cosmic Rays - Implications for Human Space Exploration

Cucinotta, Francis A.; Durant, marco; [2006]; 18 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Current space programs are shifting toward planetary exploration, and in particular towards human missions to the moon and Mars. However, space radiation is a major barrier to human exploration of the solar system because the biological effects of high-energy and charge (HZE) ions, which are the main contributors to radiation risks in deep space, are poorly understood. Predictions of the nature and magnitude of the risks posed by space radiation are subject to very large uncertainties. Great efforts have been dedicated worldwide in recent years toward a better understanding of the oncogenic potential of galactic cosmic rays. A review of the new results in this field will be presented here.

Author

Extraterrestrial Radiation; Exposure; Biological Effects; Cancer; Galactic Cosmic Rays; Carcinogens

20080029373 NASA Johnson Space Center, Houston, TX, USA

A Strategy to Safely Live and Work in the Space Radiation Environment

Corbin, Barbara J.; Sulzman, Frank M.; Krenek, Sam; February 14, 2006; 1 pp.; In English; Space Technology and Applications International, 14-15 Feb. 2006, Albuquerque, NM, USA; No Copyright; Avail.: Other Sources; Abstract Only

The goal of the National Aeronautics and Space Agency and the Space Radiation Project is to ensure that astronauts can safely live and work in the space radiation environment. The space radiation environment poses both acute and chronic risks to crew health and safety, but unlike some other aspects of space travel, space radiation exposure has clinically relevant implications for the lifetime of the crew. The term safely means that risks are sufficiently understood such that acceptable limits on mission, post-mission and multi-mission consequences (for example, excess lifetime fatal cancer risk) can be defined. The Space Radiation Project strategy has several elements. The first element is to use a peer-reviewed research program to increase our mechanistic knowledge and genetic capabilities to develop tools for individual risk projection, thereby reducing our dependency on epidemiological data and population-based risk assessment. The second element is to use the NASA Space Radiation Laboratory to provide a ground-based facility to study the understanding of health effects/mechanisms of damage from space radiation exposure and the development and validation of biological models of risk, as well as methods for extrapolation to human risk. The third element is a risk modeling effort that integrates the results from research efforts into models of human risk to reduce uncertainties in predicting risk of carcinogenesis, central nervous system damage, degenerative tissue disease, and acute radiation effects. To understand the biological basis for risk, we must also understand the physical aspects of the crew environment. Thus the fourth element develops computer codes to predict radiation transport properties, evaluate integrated shielding technologies and provide design optimization recommendations for the design of human space systems. Understanding the risks and determining methods to mitigate the risks are keys to a successful radiation protection strategy.

Author

Extraterrestrial Radiation; Aerospace Environments; Aerospace Safety; Astronauts

20080029376 NASA Johnson Space Center, Houston, TX, USA

The Role of Non-Targeted Effects as Mediators in the Biological Effects of Proton Irradiation

Cucinotta, Francis A.; Dicello, John F.; October 18, 2006; 1 pp.; In English; Fundamental Concepts of Proton Beam Therapy for a Hospital Environment, 18-20 Oct. 2006, Palm Springs, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

In recent years, the hypothesis that non-DNA targets are primary initiators and mediators of the biological effects of ionizing radiation, such as proton beams and heavy ions, has gained much interest. These phenomena have been denoted as non-targeted or bystander effects to distinguish them from the more traditionally studied model that focuses on direct damage to DNA causing chromosomal rearrangements and mutations as causative of most biological endpoints such as cell killing, tissue damage, and cancer. We review cellular and extra-cellular structures and signal transduction pathways that have been implemented in these recent studies. Non-targeted effects of interest include oxidative damage to the cytoplasm and mitochondria, disruption of the extra-cellular matrix, and modification of cytokine signaling including TGF-beta, and gap junction communication. We present an introduction to these targets and pathways, and contrast there role with DNA damage pathways.

Author

Biological Effects; Ionizing Radiation; Proton Irradiation; Genetics

20080030270 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Characterization of MODIS VIS/NIR Spectral Band Detector-to-Detector Difference

Xiong, X.; Sun, J.; Meister, G.; Kwiakowska, E.; [2008]; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

MODIS has 36 spectral bands with wavelengths in the visible (VIS), near-infrared (NIR), shortwave infrared (SWTR), mid-wave infrared (MWIR), and long-wave infrared (LWIR). It makes observations at three nadir spatial resolutions: 0,25km for bands 1-2 with 40 detectors per band, 0.5km for bands 3-7 with 20 detectors per band, and 1km for bands 8-36 with 10 detectors per band. The VIS, NIR, and S\VIR spectral bands are the reflective solar bands (RSB), which are calibrated on-orbit by a solar diffuser (SD). In addition, MODIS lunar observations are used to track the RSB calibration stability. In this study, we examine detector-to-detector calibration difference for the VIStNIR spectral bands using the SD and lunar observations. The results will be compared with an independent analysis with additional information, such as polarization correction, derived from standard ocean color data products. The current MODIS RSB calibration approach only carries a band-averaged RVS (response versus scan angle) correction. The results from this study suggest that a detector-based RVS correction should be used to improve the L1B data quality, especially for several VIS bands in Terra MODIS due to large changes of the scan mirror's optical properties in recent years.

Author

MODIS (Radiometry); Calibrating; Imaging Spectrometers; Water Color; Spectral Bands; Optical Properties; Infrared Radiation

20080030783 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Finding our Origins with the Hubble and James Webb Space Telescopes

Gardner, Jonathan P.; February 20, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

NASA is planning a successor to the Hubble Space Telescope designed to study the origins of galaxies, stars, planets and life in the universe. In this talk, Dr. Gardner will discuss the origin and evolution of galaxies, beginning with the Big Bang and tracing what we have learned with Hubble through to the present day. He will show that results from studies with Hubble have led to plans for its successor, the James Webb Space Telescope. Webb is scheduled to launch in 2013, and is designed to find the first galaxies that formed in the distant past and to penetrate the dusty clouds of gas where stars are still forming today. He will compare Webb to Hubble, and discuss recent progress in the construction of the observatory.

Author

Galactic Evolution; Spaceborne Telescopes; Dust; Galaxies; Hubble Space Telescope; James Webb Space Telescope

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