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Langley Research Center
Scientific and Technical Information Program Office

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STAR

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WHAT'S INSIDE

NASA STI Program ... in Profile

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

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

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

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

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.

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

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

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  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7115 Standard Drive
  Hanover, MD 21076-1320

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

STAR includes citations to R&D results reported in:

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

The NASA STI Program

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

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

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

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

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. 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.

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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 Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Subject Category Guide.*

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Astronautics

Chemistry and Materials

Engineering

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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

Indexes

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

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20070023933 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Proven Innovations and New Initiatives in Ground System Development: Reducing Costs in the Ground System

Gunn, Jody M.; June 19, 2006; 4 pp.; In English; SpaceOps Conference 2006: Earth, Moon, Mars, and Beyond, 19-23 June 2006, Rome, Italy; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40102

The state-of-the-practice for engineering and development of Ground Systems has evolved significantly over the past half decade. Missions that challenge ground system developers with significantly reduced budgets in spite of requirements for greater and previously unimagined functionality are now the norm. Making the right trades early in the mission lifecycle is one of the key factors to minimizing ground system costs. The Mission Operations Strategic Leadership Team at the Jet Propulsion Laboratory has spent the last year collecting and working through successes and failures in ground systems for application to future missions.

Author

Cost Reduction; Ground Based Control; Mission Planning; Systems Engineering

20070024888 Government Accountability Office, Washington, DC, USA

Commercial Aviation: Potential Safety and Capacity Issues Associated with the Introduction of the New A380 Aircraft

Apr. 2007; 72 pp.; In English

Report No.(s): PB2007-108727; GAO-07-483; No Copyright; Avail.: CASI: A04, Hardcopy

Airbus S.A.S. (Airbus), a European aircraft manufacturer, is introducing a new aircraft designated as the A380, which is expected to enter service in late 2007. The A380 will be the largest passenger aircraft in the world, with a wingspan of about 262 feet, a tail fin reaching 80 feet high, and a maximum takeoff weight of 1.2 million pounds. The A380 has a double deck and could seat up to 853 passengers. GAO was asked to examine the impact of the A380 on U.S. airports. In May 2006, GAO issued a report that estimated the costs of infrastructure changes at U.S. airports to accommodate the A380. This report discusses (1) the safety issues associated with introducing the A380 at U.S. airports, (2) the potential impact of A380 operations on the capacity of U.S. airports, and (3) how selected foreign airports are preparing to accommodate the A380. To address these issues, GAO reviewed studies on operational and safety issues related to the A380 and conducted site visits to the 18 U.S. airports and 11 Asian, Canadian, and European airports preparing to receive the A380. GAO provided the Federal Aviation Administration (FAA) and Airbus a copy of the draft report for review.

NTIS

A-380 Aircraft; Aircraft Safety; Airline Operations; Commercial Aircraft; Flight Safety

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.

20070023899 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Aerodynamics of Trans-Atmospheric Vehicles: A Non-Dimensional Approach
Ustinov, Eugene A.; January 9, 2006; 10 pp.; In English; AIAA Aerospace Sciences Meeting and Exhibit, 9-12 January 2006, Reno, NV, USA; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40092

A novel non-dimensional approach to flight dynamics of a trans-atmospheric vehicle is proposed. This approach explicitly takes into account the vertical span of the atmosphere (atmospheric scale height) as well as atmospheric mass load (atmospheric pressure) at the given flight level. As an example of application of this approach, a simple analytic model of the flight dynamics is considered for the powered boost and non-powered glide of a trans-atmospheric vehicle.
Author
Aerodynamics; Mathematical Models; Transatmospheric Vehicles; Boostglide Vehicles; Interplanetary Spacecraft

20070024438 NASA Johnson Space Center, Houston, TX, USA
Orion Entry, Descent, and Landing Simulation
Hoelscher, Brian R.; August 20, 2007; 22 pp.; In English; AIAA GN&C Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024438

The Orion Entry, Descent, and Landing simulation was created over the past two years to serve as the primary Crew Exploration Vehicle guidance, navigation, and control (GN&C) design and analysis tool at the National Aeronautics and Space Administration (NASA). The Advanced NASA Technology Architecture for Exploration Studies (ANTARES) simulation is a six degree-of-freedom tool with a unique design architecture which has a high level of flexibility. This paper describes the decision history and motivations that guided the creation of this simulation tool. The capabilities of the models within ANTARES are presented in detail. Special attention is given to features of the highly flexible GN&C architecture and the details of the implemented GN&C algorithms. ANTARES provides a foundation simulation for the Orion Project that has already been successfully used for requirements analysis, system definition analysis, and preliminary GN&C design analysis. ANTARES will find useful application in engineering analysis, mission operations, crew training, avionics-in-the-loop testing, etc. This paper focuses on the entry simulation aspect of ANTARES, which is part of a bigger simulation package supporting the entire mission profile of the Orion vehicle. The unique aspects of entry GN&C design are covered, including how the simulation is being used for Monte Carlo dispersion analysis and for support of linear stability analysis. Sample simulation output from ANTARES is presented in an appendix.
Author
Crew Exploration Vehicle; Descent; Atmospheric Entry; NASA Programs; Landing Simulation; Technology Utilization; Architecture (Computers)

20070024884 William J. Hughes Technical Center, Atlantic City, NJ, USA
Evaluation of Quad-Agent Small Firefighting System
Bagot, K.; Subbotin, N.; May 2006; 28 pp.; In English
Report No.(s): PB2007-108707; No Copyright; Avail.: National Technical Information Service (NTIS)

Technological advances and firefighting research have helped improve new firefighting systems on large and small aircraft rescue and firefighting vehicles at airports. One such technology is a quad-agent firefighting system that has the capability to discharge four firefighting agents, i.e., water, foam, dry chemical (potassium bicarbonate (PK)), and clean agent (Halotron), individually or simultaneously. Water by itself is typically not used for aviation fuel firefighting. The water in the quad-agent system is used to mix with foam concentrate solution to create firefighting foam. The quad-agent firefighting system attempts to advance the concept of multiple agents simultaneously applied to the fire to affect a more rapid extinguishment of pool and flowing fuel fires, and maximize fire fighter safety by extending the distance needed to properly apply agent to the fire using its pulse delivery technology. This research evaluated the capabilities and effectiveness of a quad-agent firefighting system. The research was done in terms of using different combinations of firefighting agents from the same discharge point during an agent flow duration test, agent discharge distance test, engine nacelle flowing fuel fires, and large-scale pool fires. The

results showed that during the agent flow duration tests, using aqueous film forming foam (AFFF) only, the quad-agent system produced an average flow duration of 155 seconds in compressed air foam (CAF) mode.
NTIS
Fire Extinguishers; Fire Fighting; Technology Assessment

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.

20070023785 Civil Aeromedical Inst., Oklahoma City, OK USA
Validation for CFD Prediction of Mass Transport in an Aircraft Passenger Cabin
Baker, A J; Ericson, S C; Orzechowski, J A; Wong, K L; Garner, R P; Nov 2006; 55 pp.; In English
Report No.(s): AD-A465914; DOT/FAA/AM-06/27; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465914

A joint project was established to validate computational fluid dynamics (CFD) as a quantitative methodology for prediction of the distribution of pathogens released into the environmental control system (ECS)-generated ventilation flow field of an aircraft passenger cabin. Acquisition of the requisite experimental databases for three-dimensional velocity and gaseous contaminant distributions was accomplished in the FAA Civil Aerospace Medical Institute's (CAMI's) Aircraft Environmental Research Facility (AERF). The associated CFD simulations were conducted by the University of Tennessee CFD Laboratory staff, on the resident Beowulf PC cluster and/or the University of Tennessee Innovative Computing Laboratory SiNRG cluster, using both commercial and proprietary CFD computer codes. The results of this CFD validation project are reported herein.
DTIC
Aircraft Compartments; Computational Fluid Dynamics; Contaminants; Mass Transfer; Microorganisms; Passenger Aircraft; Passengers; Pathogens; Transport Aircraft

20070024728 Bechtel Nevada Corp., Las Vegas, NV, USA
Identification of Aircraft Hazards (October 2006)
Ashley, K.; Oct. 2006; 70 pp.; In English
Report No.(s): DE2007-899282; No Copyright; Avail.: Department of Energy Information Bridge

Aircraft hazards were determined to be potentially applicable to a repository at Yucca Mountain in Monitored Geological Repository External Events Hazards Screening Analysis (BSC 2005 (DIRS 174235), Section 6.4.1). That determination was conservatively based upon limited knowledge of flight data in the area of concern and upon crash data for aircraft of the type flying near Yucca Mountain. The purpose of this report is to identify specific aircraft hazards that may be applicable to a monitored geologic repository (MGR) at Yucca Mountain, using NUREG- 0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (NRC 1987 (DIRS 103124), Section 3.5.1.6), as guidance for the inclusion or exclusion of identified aircraft hazards. The intended use of this report is to provide inputs for further screening and analysis of identified aircraft hazards based upon the criteria that apply to Category 1 and Category 2 event sequence analyses as defined in 10 CFR 63.2 (DIRS 176544) (Section 4). The scope of this report includes the evaluation of military, private, and commercial use of airspace in the 100-mile regional setting of the repository at Yucca Mountain with the potential for reducing the regional setting to a more manageable size after consideration of applicable screening criteria (Section 7).
NTIS
Hazards; Mountains

20070024877 Government Accountability Office, Washington, DC, USA
Aviation Security: Federal Efforts to Secure U.S.-Bound Air Cargo Are in the Early Stages and Could Be Strengthened
Apr. 2007; 107 pp.; In English
Report No.(s): PB2007-108736; GAO-07-660; No Copyright; Avail.: CASI: A06, Hardcopy

The Department of Homeland Security (DHS) has primary responsibility for securing air cargo transported into the USA from another country, referred to as inbound air cargo, and preventing implements of terrorism from entering the country.

GAO examined (1) what actions DHS has taken to secure inbound air cargo, and how, if at all, these efforts could be strengthened; and (2) what practices the air cargo industry and foreign governments have adopted that could enhance DHS's efforts to strengthen inbound air cargo security, and to what extent DHS has worked with foreign governments to enhance their air cargo security efforts. To conduct this study, GAO reviewed relevant DHS documents, interviewed DHS officials, and conducted site visits to seven countries in Europe and Asia.
NTIS
Air Cargo; Security; Air Transportation; Aircraft Safety

20070024978 Department of Energy, Las Vegas, NV, USA
Frequency Analysis of Aircraft Hazards for License Application
Ashley, K. L.; Oct. 2006; 136 pp.; In English
Report No.(s): DE2007-899283; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this analysis is to estimate crash frequencies for aircraft hazards identified for detailed analysis in Identification of Aircraft Hazards (Reference 2.1.3, Section 8). Reference 2.1.3, Section 8, also identifies a potential hazard associated with electronic jamming, which will be addressed in this analysis. This analysis will address only the repository and not the transportation routes to the site.
NTIS
Crashes; Frequencies; Hazards

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.

20070024422 NASA Dryden Flight Research Center, Edwards, CA, USA
X-31 Mishap: Lessons Learned
Larson, Richard R.; May 07, 2007; 33 pp.; In English; AIAA Infotech\@Aerospace 2007 Conference and Exhibit, 7-10 May 2007, Rohnert Park, CA, USA; CD-ROM contains Microsoft Word, Power Point and JPEG files. Also includes a MPEG video of the X-31 Tail No. 584 mishap.; No Copyright; Avail.: CASI: C01, CD-ROM

The experimental X-31 High Angle of Attack Research Aircraft crashed during a 1995 test mission flight conducted by NASA at Edwards Air Force Base, California. The pilot lost control of the airplane and was forced to eject, sustaining a permanent back injury that ended his flying career. Prior to this incident the airplane had a perfect record of several hundred non-eventful flights supported by an experienced team. During the subsequent investigation by a mishap committee it was discovered that a series of cascading events contributed to this accident. Some of the identified contributing factors that resulted in this mishap are common to aircraft design and to flight-test in general. The mistakes and the solutions are presented here so that the flight-test community may consider and learn from them. The primary cause of the crash was icing and, ultimately, a complete blockage of the pitot-static nose probe. The icing was caused by a freak weather phenomenon that was neither expected nor known to exist on the day of the mishap. The normal probe had been replaced with a special Kiel probe to allow total pressure measurements of up to 70 degrees angle of attack for flight-test purposes. The Kiel probe did not include a heater, because it was assumed that the airplane would not be flown in the clouds or in conditions conducive to icing. This assumption was later proven to be incorrect. The iced Kiel probe caused incorrect gain scheduling in the flight control system, resulting in an unstable aircraft. This failure was essentially undetected because of a faulty design in the flight control system architecture. There were, however, also a number of other issues that lead up to this situation that never should have happened. This presentation discusses what the issues were that contributed to the incident. After the incident was investigated, some of these issues were addressed and some changes were made. The second X-31 aircraft flew the remainder of the flight tests, and the program was successfully completed without incident. This presentation also shows a video of the mishap including lessons learned, and the changes that were made to resume the flight-test program are presented.
Author
Flight Tests; Accident Investigation; Aircraft Accidents; Aircraft Icing; X-31 Aircraft

20070024435 NASA Dryden Flight Research Center, Edwards, CA, USA
Flight Test of the F/A-18 Active Aeroelastic Wing Airplane
Voracek, David; May 08, 2007; 26 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024435

A viewgraph presentation of flight tests performed on the F/A active aeroelastic wing airplane is shown. The topics include: 1) F/A-18 AAW Airplane; 2) F/A-18 AAW Control Surfaces; 3) Flight Test Background; 4) Roll Control Effectiveness Regions; 5) AAW Design Test Points; 6) AAW Phase I Test Maneuvers; 7) OBES Pitch Doublets; 8) OBES Roll Doublets; 9) AAW Aileron Flexibility; 10) Phase I - Lessons Learned; 11) Control Law Development and Verification & Validation Testing; 12) AAW Phase II RFCS Envelopes; 13) AAW 1-g Phase II Flight Test; 14) Region I - Subsonic 1-g Rolls; 15) Region I - Subsonic 1-g 360 Roll; 16) Region II - Supersonic 1-g Rolls; 17) Region II - Supersonic 1-g 360 Roll; 18) Region III - Subsonic 1-g Rolls; 19) Roll Axis HOS/LOS Comparison Region II - Supersonic (open-loop); 20) Roll Axis HOS/LOS Comparison Region II - Supersonic (closed-loop); 21) AAW Phase II Elevated-g Flight Test; 22) Region I - Subsonic 4-g RPO; and 23) Phase II - Lessons Learned
CASI
Flight Tests; Aeroelastic Research Wings; F-18 Aircraft; Control Surfaces

20070024672 Sandia National Labs., Albuquerque, NM, USA
Experimental Characterization of Spin Motor Nozzle Flow
Peterson, C. W.; Henfling, J. F.; Erven, R. J.; Nov. 01, 2006; 65 pp.; In English
Report No.(s): DE2007-897913; SAND2006-6763; No Copyright; Avail.: National Technical Information Service (NTIS)

The Mach number in the inviscid core of the flow exiting scarfed supersonic nozzles was measured using pitot probes. Nozzle characterization experiments were conducted in a modified section of an obsolete M = 7.3 test section/nozzle assembly on Sandia's Hypersonic Wind Tunnel. By capitalizing on existing hardware, the cost and time required for tunnel modifications were significantly reduced. Repeatability of pitot pressure measurements was excellent, and instrumentation errors were reduced by optimizing the pressure range of the transducers used for each test run. Bias errors in probe position prevented us from performing a successful in situ calibration of probe angle effects using pitot probes placed at an angle to the nozzle centerline. The abrupt throat geometry used in the Baseline and Configuration A and B nozzles modeled the throat geometry of the flight vehicle's spin motor nozzles. Survey data indicates that small ('unmeasurable') differences in the nozzle throat geometries produced measurable flow asymmetries and differences in the flow fields generated by supposedly identical nozzles. Therefore, data from the Baseline and Configuration A and B nozzles cannot be used for computational fluid dynamics (CFD) code validation. Configuration C and D nozzles replaced the abrupt throat geometry of Baseline and Configuration A and B nozzles with a 0.500-inch streamwise radius of curvature in the throat region. This throat geometry eliminated the flow asymmetries, flow separation in the nozzle throat, and measurable differences between the flow fields from identical nozzles that were observed in Baseline/A/B nozzles. Data from Configuration C and D nozzles can be used for CFD code validation.
NTIS
Mach Number; Nozzle Flow; Supersonic Flow; Wind Tunnel Tests; Nozzle Geometry

20070024994 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Workers' Exposures to n-Propyl Bromide at an Aerospace Components Manufacturer
Hanley, K. W.; Dunn, K.; Solberger, R.; Nov. 2006; 26 pp.; In English
Report No.(s): PB2007-108702; IWSB-232-12; No Copyright; Avail.: CASI: A03, Hardcopy

The National Institute for Occupational Safety and Health (NIOSH) conducted a field study at an aerospace component manufacturing plant where n-propyl bromide (nPB) was used as a vapor degreasing solvent. Workers' breathing zone and exhaled breath concentrations of nPB and isopropyl bromide (iPB), and urinary metabolite concentrations of bromide and propyl mercapturic acid were measured. n-Propyl bromide has been marketed to replace ozone depleting solvents 1,1,1-trichloroethane and freons, as well as suspect carcinogens trichloroethylene and methylene chloride; chemicals that were commonly used in industry. Very little data are currently available to evaluate human exposure to nPB. However, there is concern that nPB may be a hematological, reproductive, or neurological toxin, based on analogy to other brominated-propanes, animal toxicity studies, and a limited number of case studies.
NTIS
Bromides; Exposure; Health; Personnel; Safety

20070025036 NASA Dryden Flight Research Center, Edwards, CA, USA
AARD - Autonomous Airborne Refueling Demonstration
Ewers, Dick; April 20, 2007; 47 pp.; In English; East Coast SETP Symopsium, 19-20 April 2007, Arlington, VA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: C01, CD-ROM: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025036

This viewgraph document reviews the Autonomous Airborne Refueling Demonstration program, and NASA Dryden's work in the program. The primary goal of the program is to make one fully automatic probe-to-drogue engagement using the AARD system. There are pictures of the aircraft approaching to the docking.
CASI
Autonomous Docking; Automatic Control; Aircraft Control; Aircraft Maneuvers; Flight Tests

20070025037 NASA Dryden Flight Research Center, Edwards, CA, USA
Abort Flight Test Project Overview
Sitz, Joel; May 10, 2007; 10 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025037

A general overview of the Orion abort flight test is presented. The contents include: 1) Abort Flight Test Project Overview; 2) DFRC Exploration Mission Directorate; 3) Abort Flight Test; 4) Flight Test Configurations; 5) Flight Test Vehicle Engineering Office; 6) DFRC FTA Scope; 7) Flight Test Operations; 8) DFRC Ops Support; 9) Launch Facilities; and 10) Scope of Launch Abort Flight Test
CASI
Flight Test Vehicles; General Overviews; Aborted Missions; Crew Exploration Vehicle; Flight Tests

20070025074
Airfoil Surface Impedance Modificaton for Noise Reduction in Turbofan Engines
Prasad, Dilip, Editor; Morin, Bruce L., Editor; Lord, Wesley K., Editor; Mathews, Douglas C., Editor; 23 Jun. 2005; 6 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS3-98005
Patent Info.: Filed 22 Dec . 2003; US-Patent-Appl-10/744983; US 2005/0135924
Report No.(s): PB2007-103106; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025074

In accordance with the present invention, an aircraft engine is provided with a component which helps reduce the noise generated by the engine. The component has a first aerodynamic surface, a second aerodynamic surface, and a system for reducing noise without altering a pressure differential between the first aerodynamic surface and the second aerodynamic surface.
Author
Airfoils; Electrical Impedance; Noise Reduction; Turbofan Engines; Surface Properties; Jet Aircraft Noise; Engine Noise

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.

20070023725 NASA Dryden Flight Research Center, Edwards, CA, USA
ER-2: Flying Laboratory for Earth Science Studies
Navarro, Robert; June 25, 2007; 4 pp.; In English; 32nd International Symposium on Remote Sensing of Environment, 25-29 Jun. 2007, San Jose, Costa Rica; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023725

The National Aeronautics and Space Administration (NASA) Dryden Flight Research Center (DFRC), (Edwards, California, USA) has two Lockheed Martin Corporation (Bethesda, Maryland) Earth Research-2 (ER-2) aircraft that serve as high-altitude and long-range flying laboratories. The ER-2 has been utilized to conduct scientific studies of stratospheric and

tropospheric chemistry, land-use mapping, disaster assessment, preliminary testing and calibration and validation of satellite sensors. The ER-2 aircraft provides experimenters with a wide array of payload accommodation areas with suitable environment control with required electrical and mechanical interfaces. Missions may be flown out of DFRC or from remote bases worldwide. The NASA ER-2 is utilized by a variety of customers, including U.S. Government agencies, civilian organizations, universities, and state governments. The combination of the ER-2 s range, endurance, altitude, payload power, payload volume and payload weight capabilities complemented by a trained maintenance and operations team provides an excellent and unique platform system to the science community.
Author
Earth Sciences; U-2 Aircraft; Flying Platforms; Avionics

20070023745 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Efficient and Robust Data Collection Using Compact Micro Hardware, Distributed Bus Architectures and Optimizing Software
Chau, Savio; Vatan, Farrokh; Randolph, Vincent; Baroth, Edmund C.; July 9, 2006; 17 pp.; In English; 42nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 9-12 Jul. 2006, Sacramento, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40120

Future In-Space propulsion systems for exploration programs will invariably require data collection from a large number of sensors. Consider the sensors needed for monitoring several vehicle systems states of health, including the collection of structural health data, over a large area. This would include the fuel tanks, habitat structure, and science containment of systems required for Lunar, Mars, or deep space exploration. Such a system would consist of several hundred or even thousands of sensors. Conventional avionics system design will require these sensors to be connected to a few Remote Health Units (RHU), which are connected to robust, micro flight computers through a serial bus. This results in a large mass of cabling and unacceptable weight. This paper first gives a survey of several techniques that may reduce the cabling mass for sensors. These techniques can be categorized into four classes: power line communication, serial sensor buses, compound serial buses, and wireless network. The power line communication approach uses the power line to carry both power and data, so that the conventional data lines can be eliminated. The serial sensor bus approach reduces most of the cabling by connecting all the sensors with a single (or redundant) serial bus. Many standard buses for industrial control and sensor buses can support several hundreds of nodes, however, have not been space qualified. Conventional avionics serial buses such as the Mil-Std-1553B bus and IEEE 1394a are space qualified but can support only a limited number of nodes. The third approach is to combine avionics buses to increase their addressability. The reliability, EMI/EMC, and flight qualification issues of wireless networks have to be addressed. Several wireless networks such as the IEEE 802.11 and Ultra Wide Band are surveyed in this paper. The placement of sensors can also affect cable mass. Excessive sensors increase the number of cables unnecessarily. Insufficient number of sensors may not provide adequate coverage of the system. This paper also discusses an optimal technique to place and validate sensors.
Author
Avionics; Data Acquisition; Hardware; Computer Programs; Microelectronics; Architecture (Computers); Distributed Processing; Software Engineering; Airborne/Spaceborne Computers; Bus Conductors

20070024423 NASA Dryden Flight Research Center, Edwards, CA, USA
SOFIA Project: SOFIA-Stratospheric Observatory for Infrared Astronomy
Tseng, Ting; May 08, 2007; 15 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024423

A viewgraph presentation on the SOFIA project is shown. The topics include: 1) Aircraft Information; 2) Major Components of SOFIA; 3) Aircraft External View; 4) Airborne Observatory Layout; 5) Telescope Assembly; 6) Uncoated Primary Mirror; 7) Airborne Astronomy; 8) Requirements & Specifications; 9) Technical Challenges; 10) Observatory Operation; and 11) SOFIA Flight Test.
CASI
SOFIA (Airborne Observatory); Aircraft Design; Avionics; Spaceborne Telescopes

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.

20070024703 McCracken and Frank, LLP, Chicago, IL, USA

Compact Fastening Collar and Stud for Connecting Walls of a Nozzle Liner and Method Associated Therewith

Mayer, R. R., Inventor; Engsberg, E. C., Inventor; 18 Dec 03; 9 pp.; In English

Contract(s)/Grant(s): AF-F33657-01-C-1240

Patent Info.: Filed Filed 18 Dec 03; US-Patent-Appl-SN-10-741-836

Report No.(s): PB2007-102622; No Copyright; Avail.: CASI: A02, Hardcopy

A combination for connecting a hot sheet and a cold sheet of a nozzle liner in spaced relationship apart includes a stud having a main body wherein the stud is attached to the hot sheet and a portion of the stud extends through an opening in the cold sheet. A support spaces the hot sheet and the cold sheet apart. A generally planar fastening collar is affixed to the portion of the stud extending through the cold sheet. A first length is defined by the portion of the stud extending through the cold sheet to a distal end of the stud. A second length is defined between a first planar surface of the collar facing the cold sheet and a second planar surface of the collar opposite the first surface. Each of the first and second lengths is less is less than a diameter of the main body of the stud.

NTIS

Connectors; Fasteners; Gas Turbine Engines; Linings; Nozzle Walls; Studs (Structural Members); Walls

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.

20070023944 NASA Dryden Flight Research Center, Edwards, CA, USA

G-III Precision Autopilot Development in Support of UAVSAR Program

Lee, James; Strovers, Brian; Lin, Victor; June 19, 2007; In English; NSTC 2007 - 1st Annual NASA Science Technology Conference, 19-23 June 2007, Adelphi, MD, USA; CD-ROM contains a Powerpoint presentation as well as four video clips.; No Copyright; Avail.: CASI: C01, CD-ROM

This viewgraph presentation reviews NASA Dryden's role in the UAVSAR Program. The primary objective of the UAVSAR Project is to develop a miniaturized polarimetric L-band synthetic aperture radar (SAR) for use on an unmanned aerial vehicle (UAV) or minimally piloted vehicle. Dryden's work in developing the Platform Precision Autopilot (PPA) capability is described in this presentation. The goal for the development is that the PPA shall fly the G-III within a 10 m (32.8 ft) diameter tube for at least 90% of each data take in conditions of calm to light atmospheric disturbances, as defined. The G-III aircraft is descrbed, the test plan is outlined, and the initial test results are reviewed.

CASI

Automatic Pilots; Pilotless Aircraft; Synthetic Aperture Radar; Automatic Flight Control; Aircraft Control; Automatic Control; Flight Tests

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)*.

20070024645 NASA Dryden Flight Research Center, Edwards, CA, USA

The NASA Dryden Flight Research Center Unmanned Aircraft System Service Capabilities

Bauer, Jeff; June 14, 2007; 5 pp.; In English; UAV International, 11-14 Jun. 2007, Paris, France; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Over 60 years of Unmanned Aircraft System (UAS) expertise at the National Aeronautics and Space Administration

(NASA) Dryden Flight Research Center are being leveraged to provide capability and expertise to the international UAS community. The DFRC brings together technical experts, UAS, and an operational environment to provide government and industry a broad capability to conduct research, perform operations, and mature systems, sensors, and regulation. The cornerstone of this effort is the acquisition of both a Global Hawk (Northrop Grumman Corporation, Los Angeles, California) and Predator B (General Atomics Aeronautical Systems, Inc., San Diego, California) unmanned aircraft system (UAS). In addition, a test range for small UAS will allow developers to conduct research and development flights without the need to obtain approval from civil authorities. Finally, experts are available to government and industry to provide safety assessments in support of operations in civil airspace. These services will allow developers to utilize limited resources to their maximum capability in a highly competitive environment.
Author
Pilotless Aircraft; High Altitude; NASA Programs; Test Facilities

12
ASTRONAUTICS (GENERAL)

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

20070024975 Sandia National Labs., Albuquerque, NM USA
Verification and Operation of Adaptive Materials in Space
Celina, M.; Dargaville, T.; Elliott, J.; Jones, G. D.; Dec. 2006; 28 pp.; In English
Report No.(s): DE2007-899377; SAND2006-7299; No Copyright; Avail.: Department of Energy Information Bridge

Piezoelectric polymers based on polyvinylidene fluoride (PVDF) are of interest as smart materials for novel space-based telescope applications. Dimensional adjustments of adaptive thin polymer films are achieved via controlled charge deposition. Predicting their long-term performance requires a detailed understanding of the piezoelectric property changes that develop during space environmental exposure. The overall materials performance is governed by a combination of chemical and physical degradation processes occurring in low Earth orbit as established by our past laboratory-based materials performance experiments (see report SAND 2005-6846). Molecular changes are primarily induced via radiative damage, and physical damage from temperature and atomic oxygen exposure is evident as depoling, loss of orientation and surface erosion. The current project extension has allowed us to design and fabricate small experimental units to be exposed to low Earth orbit environments as part of the Materials International Space Station Experiments program. The space exposure of these piezoelectric polymers will verify the observed trends and their degradation pathways, and provide feedback on using piezoelectric polymer films in space.
NTIS
Copolymers; Piezoelectricity; Space Probes; Telescopes

13
ASTRODYNAMICS

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

20070023753 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Titan Ballute Aerocapture Using a Perturbed TitanGRAM Model
Johnson, Wyatt R.; Lyons, Dan T.; August 16, 2004; 11 pp.; In English; AIAA/AAS Astrodynamics Specialst Conference and Exhibit, 16-19 August 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39990

Aerocapture using a towed, inflatable ballute system has been shown to provide significant performance advantages compared to traditional technologies, including lower heating rates and accommodation of larger navigational uncertainties. This paper extends previous results by designing a ballute aerocapture separation algorithm that can operate in a more realistic

Titan atmospheric model based on TitanGRAM. This model incorporates both latitudinal variability as well as noisiness in the density profile.
Author
Aerocapture; Ballutes; Perturbation; Algorithms; Atmospheric Models; Titan

20070023755 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
MGS and Odyssey - Relay Satellites for the MER Mission
Esposito, Pasquale B.; Bhat, R.; Demcak, S.; Ardakab, S.; Breeden, J.; Helfrich, C.; Jefferson, D.; Stauch, J.; August 16, 2004; 18 pp.; In English; AIAA/AAS Astrodynamics Specialst Conference and Exhibit, 16-19 August 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39987

Both Mars Global Surveyor (MGS) and Mars Odyssey are currently in low altitude, nearly circular and highly inclined orbits about Mars. Thus, they are available and compatible to serve as relay satellites for the Mars Exploration Rover (MER) mission. Consequently, the MER project developed requirements for MGS to be overhead, at a specific time with a 30 second tolerance, during the atmospheric entry, descent and landing (EDL) phase of both MER vehicles. The result, after execution of a single orbit synchronization maneuver (OSM) on 10/03/03, 92.4 days or 1130 orbits before Spirit's EDL, was that MGS was over Spirit 8 seconds past the required time. This maneuver, with a delta-velocity of 0.534 m/s, caused the orbital period to change by 3.34 s and resulted in a time-phasing change of 62 min 19 s in order to achieve the EDL overflight. Based on the navigation and execution of an OSM on 01/04/04, MGS was overhead for the Opportunity EDL on 01/25/04,3.5 seconds after the required epoch. Requirements also existed for the Odyssey over-flight of the MER rovers after landing and various equipment deployments had been completed. Thus, these requirements were that Odyssey should rise no earlier than specified times with respect to each of the landing sites. The Odyssey over-flights of both Spirit and Opportunity on sol 1 were equally successful. This paper will present the navigation plan, trajectory propagation accuracy and maneuver execution for the successful MGS and Odyssey over-flights of both the MER rovers.
Author
2001 Mars Odyssey; Mars Global Surveyor; Relay Satellites; Mars Roving Vehicles; Mars Missions; Astrodynamics; Spacecraft Orbits

20070024819 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Low-thrust Orbit Transfers Using Candidate Lyapunov Functions with a Mechanism for Coasting
Petropoulos, Anastassios E.; August 19, 2004; 16 pp.; In English; AIAA/AAS Astrodynamics Specialst Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40030

We consider low-thrust orbit transfers around a central body, where specified changes are sought in orbit elements except true anomaly. The desired changes in the remaining five elements can be arbitrarily large. Candidate Lyapunov functions are created based on analytic expressions for maximum rates of change of the orbit elements and the desired changes in the elements. These functions may be thought of as proximity quotients because they provide R measure of the proximity to the target orbit. The direction of thrust needed for steepest descent to the target orbit is also available analytically. The thrust is shutoff if the effectivity of the thrust at the current location on the osculating orbit is below some threshhold value. Thus, the equations of motion can be numerically integrated to obtain quickly and simply a transfer to the target orbit. A series of transfers can be easily computed to assess the trade-off between propellant mass and flight time. Preliminary comparisons to optimal solutions show that the method, while sub-optimal, performs well.
Author
Liapunov Functions; Low Thrust; Coasting Flight; Transfer Orbits

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*.

20070024872 NASA Johnson Space Center, Houston, TX, USA
A Piloted Flight to a Near-Earth Object: A Feasibility Study
Landis, Rob; Korsmeyer, Dave; Abell, Paul; Adamo, Dan; Morrison, Dave; Lu, Ed; Lemke, Larry; Gonzales, Andy; Jones, Tom; Gershman, Bob; Sweetser, Ted; Johnson, Lindley; Hess, Mike; June 15, 2007; 56 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A04, Hardcopy

This viewgraph presentation examines flight hardware elements of the Constellation Program (CxP) and the utilization of the Crew Exploration Vehicle (CEV), Evolvable Expendable Launch Vehicles (EELVs) and Ares launch vehicles for NEO missions.
CASI
Feasibility Analysis; Near Earth Objects; Space Missions; Crew Exploration Vehicle; Launch Vehicles; Hardware; Advanced Reconn Electric Spacecraft

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*.

20070024897 NASA Johnson Space Center, Houston, TX, USA
The Predicted Growth of the Low Earth Orbit Space Debris Environment: An Assessment of Future Risk for Spacecraft
Krisko, Paula H.; [2007]; 22 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNJ05HI05C; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024897

Space debris is a worldwide-recognized issue concerning the safety of commercial, military, and exploration spacecraft. The space debris environment includes both naturally occuring meteoroids and objects in Earth orbit that are generated by human activity, termed orbital debris. Space agencies around the world are addressing the dangers of debris collisions to both crewed and robotic spacecraft. In the USA, the Orbital Debris Program Office at the NASA Johnson Space Center leads the effort to categorize debris, predict its growth, and formulate mitigation policy for the environment from low Earth orbit (LEO) through geosynchronous orbit (GEO). This paper presents recent results derived from the NASA long-term debris environment model, LEGEND. It includes the revised NASA sodium potassium droplet model, newly corrected for a factor of two over-estimation of the droplet population. The study indicates a LEO environment that is already highly collisionally active among orbital debris larger than 1 cm in size. Most of the modeled collision events are non-catastrophic (i.e., They lead to a cratering of the target, but no large scale fragmentation.). But they are potentially mission-ending, and take place between impactors smaller than 10 cm and targets larger than 10 cm. Given the small size of the impactor these events would likely be undetectable by present-day measurement means. The activity continues into the future as would be expected. Impact rates of about four per year are predicted by the current study within the next 30 years, with the majority of targets being abandoned intacts (spent upper stages and spacecraft). Still, operational spacecraft do show a small collisional activity, one that increases over time as the small fragment population increases.
Author
Earth Orbital Environments; Space Debris; Commercial Spacecraft; Safety; Meteoroids; Military Spacecraft; Robotics; Low Earth Orbits; Environment Models

20070025006 NASA Dryden Flight Research Center, Edwards, CA, USA
NASA Dryden Flight Research Center: We Fly What Others Only Imagine
Ennix-Sandhu, Kimberly; March 29, 2006; In English; 17th Annual Girs' Math/Science Conference, 29 Mar. 2006, Berkeley, CA, USA; CD-ROM contains a public service announcement about NASA, a video of STS 114 landings, a Powerpoint presentation and 11 film clips referenced in the presentation.; No Copyright; Avail.: CASI: C01, CD-ROM

A powerpoint presentation of NASA Dryden's historical and future flight programs is shown. The contents include:

1) Getting To Know NASA; 2) Our Namesake; 3) To Fly What Others Only Imagine; 4) Dryden's Mission: Advancing Technology and Science Through Flight; 5) X-1 The First of the Rocket-Powered Research Aircraft; 6) X-1 Landing; 7) Lunar Landing Research Vehicle (LLRV) Liftoff and Landing; 8) Linear Aerospike SR-71 Experiment (LASRE) Ground Test; 9) M2-F1 (The Flying Bathtub); 10) M2-F2 Drop Test; 11) Enterprise Space Shuttle Prototype; 12) Space Shuttle Columbia STS-1; 13) STS-114 Landing-August 2005; 14) Crew Exploration Vehicle (CEV); 15) What You Can Do To Succeed!; and 16) NASA Dryden Flight Research Center: This is What We Do!
CASI
Aerodynamics; NASA Space Programs; Histories; Space Transportation System; Research Aircraft

20070025058 Government Accountability Office, Washington, DC, USA
Testimony before the Subcommittee on Space and Aeronautics, Committee on Science and Technology, House of Representatives: Challenges in Completing and Sustaining the International Space Station
July 24, 2007; 11 pp.; In English
Report No.(s): GAO-07-1121T; No Copyright; Avail.: CASI: A03, Hardcopy

NASA plans to finish assembling the ISS in fiscal year 2010 and operate the station until 2016. The station is scheduled to support 6-person crew capability as early as 2009. The shuttle was to be the primary means for ISS re-supply and crew rotation. NASA's international partners were planning to augment the shuttle's capabilities with their cargo and crew spacecraft. Following the Columbia disaster in 2003, the President set a new vision for NASA that called for the shuttle's retirement in 2010 upon completing ISS assembly. As part of the Vision, NASA is developing new crew and cargo vehicles, with the crew vehicle currently scheduled to be available in the 2015 timeframe. One of the vehicles the Crew Exploration Vehicle will carry and support only crews traveling to low earth orbit and beyond and will also be capable of ferrying astronauts to and from the ISS. However, since these systems are not scheduled to become operational until 2015, NASA plans to rely on international partners and commercial providers to make up the 5-year gap in ISS logistics and crew rotation resulting from the shuttle retirement.
Derived from text
International Space Station; Aeronautical Engineering; NASA Space Programs; Technology Utilization; Space Shuttles

20070025059 Government Accountability Office, Washington, DC, USA
NASA Supplier Base: Challenges Exist in Transitioning from the Space Shuttle Program to the Next Generation of Human Space Flight Systems
July 2007; 39 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-07-940; No Copyright; Avail.: CASI: A03, Hardcopy

The Space Shuttle Program is currently supported by over 1,500 active suppliers, some of whom are the only known or certified source of a particular material, part or service. The retirement of the Shuttle and transition to planned exploration activities, as called for in the President's Vision for Space Exploration, creates the need for NASA to begin making decisions today about its supplier base needs for the future. GAO was asked to (1) describe NASA's plans and processes for managing its supplier base through the Shuttle s retirement and the transition to the Constellation's exploration activities; (2) address factors that could impact the effectiveness of those plans and processes; and (3) identify any other issues that NASA will likely encounter as the agency transitions to and implements the Constellation Program.
Derived from text
Space Shuttles; Manned Space Flight; Supplying; Management Planning; NASA Space Programs

20070025063 NASA Johnson Space Center, Houston, TX, USA
Five Years of NASA Research on ISS: A Continuing Saga
Uri, John J.; October 17, 2005; 1 pp.; In English; International Astronautical Congress, 17-21 Oct. 2005, Fukuoka, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The first NASA experiments reached ISS in September 2000, a very modest beginning to what later became a more robust, diverse and overall highly successful research program, continuing essentially uninterrupted since March 2001. Along the way, several major challenges had to be overcome. First, there were delays in the initial construction of the station. Second, maintenance of the station exceeded earlier assumptions resulting in less crew time being available for research. Third, the lengthy interruption of Shuttle flights after the Columbia accident significantly, but temporarily, reduced the research traffic to and from ISS. And fourth, the Vision of Space Exploration as caused a refocusing of NASA's research efforts on ISS from a multi-disciplinary basic and applied science program to one dedicated to solving the critical questions to enable exploration

missions. The principal factors that allowed these challenges to be overcome have been flexibility and cooperation. Flexibility on the part of the ISS Program to minimize impacts to research from delays and resource bottlenecks, flexibility on the part of researchers to adapt their research to changing environments, and flexibility to be able to use existing and planned facilities not only for their original basic science purpose but also for new applications. And cooperation not only between the ISS Program and the research community, but also among NASA and its International Partners to continually strive to optimize the research conducted aboard ISS. Once the challenges were overcome, the research program has been remarkably successful, with an expanding on-orbit capability. Over 80 investigations have been completed, many resulting in publications.
Author
International Space Station; NASA Space Programs; Research Projects; Spaceborne Experiments

20070025081 NASA Johnson Space Center, Houston, TX, USA
Space Shuttle and Space Station Radio Frequency (RF) Exposure Analysis
Hwu, Shian U.; Loh, Yin-Chung; Sham, Catherine C.; Kroll, Quin D.; October 30, 2005; 9 pp.; In English; 24th IEEE Digital Avionics Systems Conference, 30 Oct. - 3 Nov. 2005, Washington, DC, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

This paper outlines the modeling techniques and important parameters to define a rigorous but practical procedure that can verify the compliance of RF exposure to the NASA standards for astronauts and electronic equipment. The electromagnetic modeling techniques are applied to analyze RF exposure in Space Shuttle and Space Station environments with reasonable computing time and resources. The modeling techniques are capable of taking into account the field interactions with Space Shuttle and Space Station structures. The obtained results illustrate the multipath effects due to the presence of the space vehicle structures. It's necessary to include the field interactions with the space vehicle in the analysis for an accurate assessment of the RF exposure. Based on the obtained results, the RF keep out zones are identified for appropriate operational scenarios, flight rules and necessary RF transmitter constraints to ensure a safe operating environment and mission success.
Author
Electronic Equipment; Radio Frequencies; Exposure; Transmitters; Space Shuttles; Multipath Transmission

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*.

20070023754 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Martian Telecommunications Network: UHF Relay Support of the Mars Exploration Rovers by the Mars Global Surveyor, Mars Odyssey, and Mars Express Orbiters
Edwards, Charles D., Jr.; Barbieri, A.; Brower, E.; Estabrook, P.; Gibbs, R.; Horttor, R.; Ludwinski, J.; Mase, R.; McCarthy, C.; Schmidt, R.; Theisinger, P.; Thorpe, T.; Waggoner, B.; October 4, 2004; 6 pp.; In English; 55th International Astronautical Congress, 4-8 October 2004, Vancouver, BC, Canada; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40031

NASA and ESA have established an international network of Mars orbiters, outfitted with relay communications payloads, to support robotic exploration of the red planet. Starting in January, 2004, this network has provided the Mars Exploration Rovers with telecommunications relay services, significantly increasing rover engineering and science data return while enhancing mission robustness and operability. Augmenting the data return capabilities of their X-band direct-to-Earth links, the rovers are equipped with UHF transceivers allowing data to be relayed at high rate to the Mars Global Surveyor (MGS), Mars Odyssey, and Mars Express orbiters. As of 21 July, 2004, over 50 Gbits of MER data have been obtained, with nearly 95% of that data returned via the MGS and Odyssey UHF relay paths, allowing a large increase in science return from the Martian surface relative to the X-band direct-to-Earth link. The MGS spacecraft also supported high-rate UHF communications of MER engineering telemetry during the critical period of entry, descent, and landing (EDL), augmenting the very low-rate EDL data collected on the X-band direct-to-Earth link. Through adoption of the new CCSDS Proximity-1 Link Protocol, NASA and ESA have achieved interoperability among these Mars assets, as validated by a successful relay

demonstration between Spirit and Mars Express, enabling future interagency cross-support and establishing a truly international relay network at Mars.
Author
Mars Express; Mars Global Surveyor; Mars Surface; Telecommunication; Ultrahigh Frequencies; 2001 Mars Odyssey; Deep Space Network

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*.

20070023904 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Zero to Integration in Eight Months, the Dawn Ground Data System Engineering Challange
Dubon, Lydia P.; June 19, 2006; 10 pp.; In English; SpaceOps Conference, 19-23 Ju. 2006, Rome, Italy; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40123

The Dawn Project has presented the Ground Data System (GDS) with technical challenges driven by cost and schedule constraints commonly associated with National Aeronautics and Space Administration (NASA) Discovery Projects. The Dawn mission consists of a new and exciting Deep Space partnership among: the Jet Propulsion Laboratory (JPL), responsible for project management and flight operations; Orbital Sciences Corporation (OSC), spacecraft builder and responsible for flight system test and integration; and the University of California, at Los Angeles (UCLA), responsible for science planning and operations. As a cost-capped mission, one of Dawn s implementation strategies is to leverage from both flight and ground heritage. OSC's ground data system is used for flight system test and integration as part of the flight heritage strategy. Mission operations, however, are to be conducted with JPL s ground system. The system engineering challenge of dealing with two heterogeneous ground systems emerged immediately. During the first technical interchange meeting between the JPL s GDS Team and OSC's Flight Software Team, August 2003, the need to integrate the ground system with the flight software was brought to the table. This need was driven by the project s commitment to enable instrument engineering model integration in a spacecraft simulator environment, for both demonstration and risk mitigation purposes, by April 2004. This paper will describe the system engineering approach that was undertaken by JPL's GDS Team in order to meet the technical challenge within a non-negotiable eight-month schedule. Key to the success was adherence to an overall systems engineering process and fundamental systems engineering practices: decomposition of the project request into manageable requirements; definition of a structured yet flexible development process; integration of multiple ground disciplines and experts into a focused team effort; in-process risk management; and aggregation of the intermediate products to an integrated final product. In addition, this paper will highlight the role of lessons learned from the integration experience. The lessons learned from an early GDS deployment have served as the foundation for the design and implementation of the Dawn Ground Data System.
Author
Systems Engineering; Data Systems; Ground Based Control; Space Missions; Spacecraft Design

20070023916 Boeing Co., Houston, TX, USA
Effects of Free Molecular Heating on the Space Shuttle Active Thermal Control System
McCloud, Peter L.; Wobick, Craig A.; [2007]; 7 pp.; In English; 46th AIAA Aerospace Sciences Meeting and Exhibit, 7-10 January 2008, Reno, NV, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023916

During Space Transportation System (STS) flight 121, higher than predicted radiator outlet temperatures were experienced from post insertion and up until nominal correction (NC) burn two. Effects from the higher than predicted heat loads on the radiator panels led to an additional 50 lbm of supply water consumed by the Flash Evaporator System (FES). Post-flight analysis and research revealed that the additional heat loads were due to Free Molecular Heating (FMH) on the radiator panels, which previously had not been considered as a significant environmental factor for the Space Shuttle radiators. The current Orbiter radiator heat flux models were adapted to incorporate the effects of FMH in addition to solar, earth infrared and albedo sources. Previous STS flights were also examined to find additional flight data on the FMH environment. Results

of the model were compared to flight data and verified against results generated by the National Aeronautics and Space Administration (NASA), Johnson Space Center (JSC) Aero-sciences group to verify the accuracy of the model.
Author
Heat Flux; Heating; Space Shuttles; Space Transportation System Flights; Free Molecular Flow

20070024458 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Overview of Mars Science Laboratory (MSL) Environmental Program
Forgave, John C.; Man, Kin F.; Hoffman, Alan R.; March 20, 2006; 24 pp.; In English; 2nd International Workshop on Verification and Testing of Space Systems, 20-22 Mar. 2006, Turin, Italy; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40114

This viewgraph presentation is an overview of the Mars Science Laboratory (MSL) program. The engineering objectives of the program are to create a Mobile Science Laboratory capable of one Mars Year surface operational lifetime (670 Martian sols = 687 Earth days). It will be able to land and operation over wide range of latitudes, altitudes and seasons It must have controlled propulsive landing and demonstrate improved landing precision via guided entry The general science objectives are to perform science that will focus on Mars habitability, perform next generation analytical laboratory science investigations, perform remote sensing/contact investigations and carry a suite of environmental monitoring instruments. Specific scientific objectives of the MSL are: (1) Characterization of geological features, contributing to deciphering geological history and the processes that have modified rocks and regolith, including the role of water. (2) Determination of the mineralogy and chemical composition (including an inventory of elements such as C, H, N, O, P, S, etc. known to be building blocks for life) of surface and near-surface materials. (3) Determination of energy sources that could be used to sustain biological processes. (4) Characterization of organic compounds and potential biomarkers in representative regolith, rocks, and ices. (5) Determination the stable isotopic and noble gas composition of the present-day bulk atmosphere. (6) Identification potential bio-signatures (chemical, textural, isotopic) in rocks and regolith. (7) Characterization of the broad spectrum of surface radiation, including galactic cosmic radiation, solar proton events, and secondary neutrons. (8) Characterization of the local environment, including basic meteorology, the state and cycling of water and C02, and the near-surface distribution of hydrogen. Several views of the planned MSL and the rover are shown. The MSL environmental program is to: (1) Ensure the flight hardware design is capable of surviving all the environments throughout its mission life time, including ground, transportation, launch, cruise, entry decent and landing (EDL) and surface operation environments. (2) Verify environmental testing and analysis have adequately validated the flight hardware's ability to withstand all natural, self-induced, and mission-activity-induced environments. The planned tests to ascertain the capability of the MSL to perform as desired are reviewed.
CASI
Mars (Planet); Mars Surface; Mars Roving Vehicles; Mars Missions; Mars Environment; Mission Planning; Spaceborne Experiments; Space Laboratories

20070024459 NASA Johnson Space Center, Houston, TX, USA
Crew Exploration Vehicle Service Module Ascent Abort Coverage
Tedesco, Mark B.; Eans, Bryan M.; Merritt, Deborah S.; Falck, Robert D.; August 20, 2007; 21 pp.; In English; AIAA Guidance, Navigation, and Control, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 644423.02.36.15.10; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024459

The Crew Exploration Vehicle (CEV) is required to maintain continuous abort capability from lift off through destination arrival. This requirement is driven by the desire to provide the capability to safely return the crew to Earth after failure scenarios during the various phases of the mission. This paper addresses abort trajectory design considerations, concept of operations and guidance algorithm prototypes for the portion of the ascent trajectory following nominal jettison of the Launch Abort System (LAS) until safe orbit insertion. Factors such as abort system performance, crew load limits, natural environments, crew recovery, and vehicle element disposal were investigated to determine how to achieve continuous vehicle abort capability.
Author
Abort Trajectories; Ascent Trajectories; Crew Exploration Vehicle; Service Modules; Trajectory Analysis

20070024817 Cleveland State Univ., Cleveland, OH, USA

Transparent, Weakly Conductive Films for Space Applications

Griffin, John; Morgan, Ashraf; Hambourger, Paul D.; Bulletin of the American Physical Society; [2004]; 2 pp.; In English; Ohio Section Fall Meeting of the American Physical Society, 15-16 Oct. 2004, Rochester, MI, USA

Contract(s)/Grant(s): NCC3-1033; NCC3-1065; Copyright; Avail.: Other Sources; Abstract Only

Electrically insulating spacecraft surfaces are vulnerable to nonuniform charge buildup due to particles emitted by the sun. On Mars, insulating surfaces of exploration vehicles and structures will be affected by dust coatings possibly held in place by triboelectric surface charge. Application of a conductive film may be a solution to the charging problem, but the coating must be highly transparent if used on solar panels, lenses, etc. Sheet resistivity requirements depend on the application and are in the range 10(exp 2) - 10(exp 8) ohms/square. Co-deposited indium tin oxide (ITO) and MgF2 is promising, with high transparency, tailorable electrical properties, and durability to atomic oxygen. Due to ITO's relatively narrow bandgap (approximately 3.5 eV), the film might absorb enough ultraviolet to protect polymeric substrates. Recent work on dual-magnetron-sputtered ITO-MgF2 showed that a variety of polymeric substrates can be coated at room temperature. However, the sheet resistivity is very sensitive to composition, suggestive of a percolation transition. This could be a serious problem for large-scale coating production. We will report on attempts to control film composition by plasma emission monitoring of the ITO and MgF2 guns.

Author

Coating; Electrical Properties; Transparence; Protective Coatings; Spacecraft Charging; Electric Charge; Electric Fields; Aerospace Environments

20070025020 NASA Johnson Space Center, Houston, TX, USA

ANTARES: Spacecraft Simulation for Multiple User Communities and Facilities

Acevedo, Amanda; Berndt, Jon; Othon, William; Arnold, Jason; Gay, Robet; August 20, 2007; 7 pp.; In English; AIAA Modeling and Simulation Technologies Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Copyright; Avail.: CASI: A02, Hardcopy

The Advanced NASA Technology Architecture for Exploration Studies (ANTARES) simulation is the primary tool being used for requirements assessment of the NASA Orion spacecraft by the Guidance Navigation and Control (GN&C) teams at Johnson Space Center (JSC). ANTARES is a collection of packages and model libraries that are assembled and executed by the Trick simulation environment. Currently, ANTARES is being used for spacecraft design assessment, performance analysis, requirements validation, Hardware In the Loop (HWIL) and Human In the Loop (HIL) testing.

Author

Computerized Simulation; Technology Utilization; Architecture (Computers); Computer Programs; Crew Exploration Vehicle; Spacecraft Design

20070025101 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Study of Spacecraft Charging Due to Exposure to Interplanetary Protons

Green, Nelson W.; Frederickson, A. Robb; February 15, 2006; 17 pp.; In English; The Space Technology and Applications International Forum (STAIF, 12-16 Feb. 2006, Albuquerque, NM, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40112

Long life spacecraft may be exposed to one or more major solar storms during the mission lifespan. This research task was undertaken to determine the risk to long duration interplanetary spacecraft from spacecraft charging due to exposure to solar energetic protons.

Derived from text

Exposure; Solar Protons; Solar Storms; Spacecraft Charging; Interplanetary Spacecraft

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20070023746 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
An Overview of NASA Space Cryocooler Programs--2006
Ross, Ronald G., Jr.; Boyle, R. F.; June 14, 2006; 10 pp.; In English; International Cryocooler Conference, 14 Jun. 2006, Annapolis, MD, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40122

Mechanical cryocoolers represent a significant enabling technology for NASA's Earth and Space Science Enterprises. Many of NASA's space instruments require cryogenic refrigeration to improve dynamic range, extend wavelength coverage, or enable the use of advanced detectors to observe a wide range of phenomena--from crop dynamics to stellar birth. Reflecting the relative maturity of the technology at these temperatures, the largest utilization of coolers over the last fifteen years has been for instruments operating at medium to high cryogenic temperatures (55 to 150K). For the future, important new developments are focusing on the lower temperature range, from 6 to 20 K, in support of studies of the origin of the Universe and the search for planets around distant stars. NASA's development of a 20K cryocooler for the European Planck spacecraft and a 6 K cryocooler for the MIRI instrument on the James Webb Space Telescope (JWST) are examples of the thrust to provide low-temperature cooling for this class of future missions.
Author
Cryogenic Cooling; NASA Space Programs; General Overviews; Mechanical Engineering; Earth Sciences; Aerospace Sciences; Space Missions; Spacecraft Instruments

20070024442 NASA Johnson Space Center, Houston, TX, USA
'Fly-by-Wireless' : A Revolution in Aerospace Architectures for Instrumentation and Control
Studor, George F.; June 18, 2007; 19 pp.; In English; 'Fly-by-Wireless' Workshop EADS Follow-up Meeting, 18-21 Jun. 2007, Paris, France; Original contains color illustrations
Contract(s)/Grant(s): 604746.01.98.10.30; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024442

The conference presentation provides background information on Fly-by-Wireless technologies as well as reasons for implementation, CANEUS project goals, cost of change for instrumentation, reliability, focus areas, conceptual Hybrid SHMS architecture for future space habitats, real world problems that the technology can solve, evolution of Micro-WIS systems, and a WLEIDS system overview and end-to-end system design.
CASI
Wireless Communication; Spacecraft Electronic Equipment; Spacecraft Instruments

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20070023749 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
An Overview of the Nuclear Electric Xenon Ion System (NEXIS) Activity
Randolph, Thomas M.; Polk, James E., Jr.; July 12, 2004; 20 pp.; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 11-14 July 2004, Fort Lauderdale, FL, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 2004-3450; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40035

The Nuclear Electric Xenon Ion System (NEXIS) research and development activity within NASA's Project Prometheus, was one of three proposals selected by NASA to develop thruster technologies for long life, high power, high specific impulse nuclear electric propulsion systems that would enable more robust and ambitious science exploration missions to the outer solar system. NEXIS technology represents a dramatic improvement in the state-of-the-art for ion propulsion and is designed

to achieve propellant throughput capabilities >= 2000 kg and efficiencies >= 78% while increasing the thruster power to >= 20 kW and specific impulse to >= 6000 s. The NEXIS technology uses erosion resistant carbon-carbon grids, a graphite keeper, a new reservoir hollow cathode, a 65-cm diameter chamber masked to produce a 57-cm diameter ion beam, and a shared neutralizer architecture to achieve these goals. The accomplishments of the NEXIS activity so far include performance testing of a laboratory model thruster, successful completion of a proof of concept reservoir cathode 2000 hour wear test, structural and thermal analysis of a completed development model thruster design, fabrication of most of the development model piece parts, and the nearly complete vacuum facility modifications to allow long duration wear testing of high power ion thrusters. Author

Ion Engines; Ion Propulsion; Nuclear Electric Propulsion; Propulsion System Configurations; Electromagnetic Propulsion; Spacecraft Propulsion

20070024716 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA

Structural Modeling for the Terrestrial Planet Finder Mission

Kissil, Andrew; Kwack, Eug; Ho, Timothy; Liu, Alice; Blaurock, Carl; August 2, 2004; 17 pp.; In English; SPIE Space Systems Engineering and Optical Alignment Mechanisms, 2-6 August, 2004; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40019

We present the most recent propulsion requirements for the Laser Interferometer Space Antenna (LISA) Mission and describe potential microthruster technology that can meet these requirements. LISA consists of three spacecraft in heliocentric orbits, forming a triangle with 5x lo6 km sides that are the arms of three Michelson-type interferometers. Reflective proof masses provide the reference surfaces at the end of the interferometer arms as part of the Gravitational Reference Sensor (GRS) designed to detect gravitational waves. The microthrust propulsion system will be part of the Disturbance Reduction System (DRS), which is responsible for maintaining each spacecraft position within approximately 10 nm around the proof masses. To provide the necessary sensitivity, the GRS must not experience spurious accelerations > 10 (exp -15) m/s(exp 2)# Hz (exp -1/2) in the 0.1 mHz to 1 Hz bandwidth, requiring precision formation flying and drag-free operation of the LISA spacecraft. This leads to the following microthruster performance requirements: a thrust range of 2-30 microN, a thrust resolution < O.1 micro N, and thrust noise <0.1 micro N Hz (exp -1/2) over the LISA measurement bandwidth. The microthruster must provide this performance for 5 years continuously, contain 10 years worth of propellant, and not disrupt the science measurements. Potential microthruster technologies include Colloid, Field Emission Electric Propulsion (FEEP), and precision cold gas microthrusters. Each of these technologies is described in detail with focus on the NASA microthruster development of the Busek Colloid Micro-Newton Thruster (CMNT).
Author

Low Thrust Propulsion; Microthrust; Spacecraft Propulsion; Microrocket Engines

20070024848 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Power Actuation and Switching Module Development

Wester, Gene W.; Carr, Greg; Deligiannis, Frank; Jones, Loren; Lam, Barbara; Sauers, Jim; Haskell, Russ; Mulvey, Jim; August 16, 2004; 5 pp.; In English; 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39991

The Deep Space Avionics (DSA) Project is developing a Power Actuation and Switching Module (PASM). This component enables a modular and scalable design approach for power switching applications, which can result in a wide variety of power switching architectures using this simple building block. The PASM is designed to provide most of the necessary power switching functions of spacecraft for various Deep Space missions including future missions to Mars, comets, Jupiter and its moons. It is fabricated using an A SIC process that is tolerant of high radiation. The development includes two application specific integrated circuits (ASICs) and support circuitry all packaged using High Density Interconnect (HDI) technology. It can be operated in series or parallel with other PASMs, It can be used as a high-side or low-side switch and it can drive thruster valves, pyrotechnic devices such as NASA standard initiators, bus shunt resistors, and regular spacecraft component loads. Each PASM contains two independent switches with internal current limiting and over-current trip-off functions to protect the power subsystem from load faults. During turnon and turnoff each switch can limit the rate of current change (di/dt) to a value determined by the user. Threeway majority-voted On/Off commandability and full switch status telemetry (both analog and digital) are built into the module. This paper describes the development process used to design,

model, fabricate, and test these compact and versatile power switches. Preliminary test results from prototype HDI PASM hardware are also discussed.
Author
Spacecraft Components; Switching Circuits; Power Supply Circuits

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20070024420 Aspen Aerogels, Inc., Northborough, MA, USA
Polyurea Aerogels
Lee, Je Kyun, Inventor; 21 Sep. 2006; 8 pp.; In English
Contract(s)/Grant(s): NNJ04JA22C
Patent Info.: Filed 20 Mar. 2006; US-Patent-Appl-11/384475; US 2006/0211840
Report No.(s): PB2007-101397; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024420

Polyurea aerogels as well as methods for preparing the same are disclosed. One method involves mixing a polyisocyanate with a polyamine in a solvent and supercritically drying the resultant gel. Polyoxyalkyleneamine are a preferred type of the polyamines. Other optional steps for the formation of polyurea aerogels include addition of a catalyst, additives, fiber reinforcement, and aging.
Author
Aerogels; Gels; Ureas; Polymer Chemistry; Biopolymers

20070024451 Bachman and Lapointe, P.C., New Haven, CT, USA
Thermal Resistant Environmental Barrier Coating
Bhatia, Tania, Inventor; Eaton, Harry, Inventor; Sun, Ellen Y., Inventor; Lawton, Thomas H., Inventor; 9 Feb. 2006; 4 pp.; In English
Contract(s)/Grant(s): NAS3-01138
Patent Info.: Filed Filed 9 Aug 04; US-Patent-Appl-10/915158; US 2006/0029814
Report No.(s): PB2007-103931; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024451

A process for preparing a silicon based substrate with a protective coating having improved thermal resistance at temperature up to at least 1500 degrees C, and the resulting article.
Author
Barrier Layers; Silicon; Substrates; Thermal Control Coatings; Thermal Resistance; Protective Coatings

20070024690 Aerospace Corp., El Segundo, CA, USA
Synthetic Method for Conducting Polymer Nanofibers
Kaner, R. B., Inventor; Huang, J., Inventor; Weiller, B. H., Inventor; Virji, S., Inventor; 11 Dec 03; 14 pp.; In English
Contract(s)/Grant(s): AF-F04701-00-C-0009
Patent Info.: Filed Filed 11 Dec 03; US-Patent-Appl-SN-10-735-079
Report No.(s): PB2007-102608; No Copyright; Avail.: CASI: A03, Hardcopy

Polymer nanofibers, such as polyaniline nanofibers, with uniform diameters less than 500 nm can be made in bulk quantities through a facile aqueous and organic interfacial polymerization method at ambient conditions. The nanofibers have lengths varying from 500 nm to 10 .mu.m and form interconnected networks in a thin film. Thin film nanofiber sensors can be made of the polyaniline nanofibers having superior performance in both sensitivity and time response to a variety of gas vapors including, acids, bases, redox active vapors, alcohols and volatile organic chemicals.
NTIS
Conducting Polymers; Nanotechnology

20070024695 Schwegman, Lundberg, Woessner and Kluth, P.A., Minneapolis, MN, USA
Synthesis of Polyanhydrides
Uhrich, K. E., Inventor; Schmeltzer, R. C., Inventor; Anastasiou, T. J., Inventor; Pudil, B. J., Inventor; Wood, R. D., Inventor; 18 May 04; 19 pp.; In English
Contract(s)/Grant(s): NIH-DE 13207
Patent Info.: Filed Filed 18 May 04; US-Patent-Appl-SN-10-848-560
Report No.(s): PB2007-102610; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a method for forming compounds of FormulaHO--C(.dbd. O)R.sup.1--X- -R.sup.2--X--R.sup.1--C(.dbd.O)--O--H wherein compound (I) can be polymerized to provide a polymer that contains therapeutically active compounds. In the compounds of the invention, each R.sup.1 is group that will provide the therapeutically active compound upon hydrolysis of the polymer; each X is independently an ester linkage or an amide linkage; and R.sup.2 is a linking group. NTIS

Synthesis (Chemistry); Polymers; Anhydrides

20070024700 Peabody (Nixon), LLP, Rochester, NY, USA
Nucleic Acid-Engineered Materials
Luo, D., Inventor; Li, Y., Inventor; 25 Jun 04; 25 pp.; In English
Contract(s)/Grant(s): NSF-ECS-9731293
Patent Info.: Filed Filed 25 Jun 04; US-Patent-Appl-SN-10-877-697
Report No.(s): PB2007-102587; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates to the design and use of nucleic acid molecules to create novel materials. NTIS

Molecules; Nucleic Acids; Patent Applications; Biotechnology

20070024717 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Experimental Observations on Material Damping at Cryogenic Temperatures
Peng, Chia-Yen; Levine, Marie; Shido, Lillian; Leland, Robert; August 2, 2004; 19 pp.; In English; SPIE 49th International Symposium on Optical Science and Technology, 2-6 Aug. 2004, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40006

This paper describes a unique experimental facility designed to measure damping of materials at cryogenic temperatures for the Terrestrial Planet Finder (TPF) mission at the Jet Propulsion Laboratory. The test facility removes other sources of damping in the measurement by avoiding frictional interfaces, decoupling the test specimen from the support system, and by using a non-contacting measurement device. Damping data reported herein are obtained for materials (Aluminum, Aluminum/Terbium/Dysprosium, Titanium, Composites) vibrating in free-free bending modes with low strain levels (< 10(exp -6) ppm). The fundamental frequencies of material samples are ranged from 14 to 202 Hz. To provide the most beneficial data relevant to TPF-like precision optical space missions, the damping data are collected from room temperatures (around 293 K) to cryogenic temperatures (below 40 K) at unevenly-spaced intervals. More data points are collected over any region of interest. The test data shows a significant decrease in viscous damping at cryogenic temperatures. The cryogenic damping can be as low as 10(exp -4) %, but the amount of the damping decrease is a function of frequency and material. However, Titanium 15-3-3-3 shows a remarkable increase in damping at cryogenic temperatures. It demonstrates over one order of magnitude increase in damping in comparison to Aluminum 6061-T6. Given its other properties (e.g., good stiffness and low conductivity) this may prove itself to be a good candidate for the application on TPF. At room temperatures, the test data are correlated well with the damping predicted by the Zener theory. However, large discrepancies at cryogenic temperatures between the Zener theory and the test data are observed.
Author

Cryogenic Temperature; Damping; Test Facilities; Laboratories; Research Facilities; Materials Selection; Spacecraft Construction Materials

20070024720 Dewitt, Ross and Stevens, S.C., Madison, WI, USA
Fluorescence Polarization Assay to Detect Protease Cleavage
Fox, B. G., Inventor; Blommel, P. G., Inventor; 24 Nov 04; 71 pp.; In English
Contract(s)/Grant(s): NIHGM064598
Patent Info.: Filed Filed 24 Nov 04; US-Patent-Appl-SN-10-997 651
Report No.(s): PB2007-105913; No Copyright; Avail.: CASI: A04, Hardcopy

The invention discloses a method of determining protease activity, in real time, using fluorescence polarization technology. In particular, the invention provides vectors and a method for their use, which expresses uncharacterized proteins conjugated to a fluorescence tag, which binds specifically to a fluorescent ligand. Cleavage of the recombinant protein results in a fragment of the expressed peptide and results in a change in fluorescence polarization of the fluorophore. The rate of change in fluorescence polarization can be measured in real time and is equivalent to the rate of protease cleavage.
NTIS
Assaying; Cleavage; Fluorescence; Protease

20070024721 Quarles and Brandy, LLP., Milwaukee, WI, USA
2-Hydroxyethidium, Methods of Preparation and Uses Thereof
Kalyanaraman, B., Inventor; Zhano, H., Inventor; 8 Apr 04; 20 pp.; In English
Contract(s)/Grant(s): HL073056; 1P1HL0876901
Patent Info.: Filed Filed 8 Apr 04; US-Patent-Appl-SN-10-820 599
Report No.(s): PB2007-105912; No Copyright; Avail.: CASI: A03, Hardcopy

The inventors have purified the fluorescent product in the hydroethidine-based superoxide detection assays and further identified the product as 2-hydroxyethidium. Methods for synthesizing 2-hydroxyethidium and for detecting and quantifying superoxide are provided.
NTIS
Fluorescence; Assaying; Inorganic Peroxides

20070024722 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA
Synthetic Genes
Sand, D., Inventor; Kodunal, S. J., Inventor; Reid, R. C., Inventor; Patel, K. G., Inventor; 7 Apr 04; 114 pp.; In English
Contract(s)/Grant(s): 70NANB2H3014
Patent Info.: Filed Filed 7 Apr 04; US-Patent-Appl-SN-10-820 975
Report No.(s): PB2007-105911; No Copyright; Avail.: CASI: A06, Hardcopy

The invention provides strategies, methods, vectors, reagents, and systems for production of synthetic genes, production of libraries of such genes, and manipulation and characterization of the genes and corresponding encoded polypeptides. In one aspect, the synthetic genes can encode polyketide synthase polypeptides and facilitate production of therapeutically or commercially important polyketide compounds.
NTIS
Genes; Chemical Compounds; Polymers

20070024723 Quine Intellectual Property Law Group, P. C., Alameda, CA, USA, Scripps Research Inst., La Jolla, CA, USA
Site-Specific Incorporation of Redox Active Amino Acids Into Proteins
Alfornta, L., Inventor; Schultz, P. G., Inventor; Zhang, Z., Inventor; 13 Oct 04; 37 pp.; In English
Contract(s)/Grant(s): GM66494; DEFGH0300ER5812
Patent Info.: Filed Filed 13 Oct 04; US-Patent-Appl-SN-10-065 218
Report No.(s): PB2007-105910; No Copyright; Avail.: CASI: A03, Hardcopy

Compositions and methods of producing components of protein biosynthetic machinery that include orthogonal tRNAs, orthogonal aminoacyl-tRNA synthetases, and orthogonal pairs of tRNAs/synthetases, which incorporate redox active amino acids into proteins are provided. Methods for identifying these orthogonal pairs are also provided along with methods of producing proteins with redox active amino acids using these orthogonal pairs.
NTIS
Amino Acids; Oxidation-Reduction Reactions; Proteins

20070024724 Rasche (Patrick W.), Armstrong, Teasdale, LLP, Saint Louis, MO, USA
Human iPLA(sub 2 Epsilon)
Gross, M. W., Inventor; Jenkins, C. M., Inventor; 13 Dec 04; 42 pp.; In English
Contract(s)/Grant(s): 5POHL2727806A1; 5RO1HL44125010
Patent Info.: Filed Filed 13 Dec 04; US-Patent-Appl-SN-11-010 558
Report No.(s): PB2007-105907; No Copyright; Avail.: CASI: A03, Hardcopy

A novel function phospholipase A(sub 2), referred to herein as calcium-independent phospholipase A(sub 2)epsilon. (iPLA(sub 2 epsilon)) having SEQ ID NO: 1 and SEQ ID NO: 2, and nucleic acid sequences (SEQ ID NO: 3 and SEQ ID NO: 4) encoding and expressing iPLA(sub 2)epsilon. This novel enzyme has been isolated and characterized and is involved in the catalysis and hydrolysis of lipids cycling in a living cell biosystem. In an embodiment, the compromises to an isolated nucleic acid molecule comprising a set of iPLA(sub 2)epsilon polynucleotides. In an aspect of this embodiment, the iPLA(sub 2)epsilon polynucleotides encode and express an iPLA(sub 2)epsilon polypeptide. In one aspect, an isolated and characterized gene comprises a polynucleotide having a sequence shown in SEQ ID NO: 3 and SEQ ID NO: 4.
NTIS
Polynucleotides; Genetics

20070024730 Hoag (Foley), LLP, Boston, MA, USA
Novel Coordination Complexes, and Methods for Preparing By Combinatorial Methods, Assaying and Using the Same
Lippard, S. J., Inventor; Ziegler, C. J., Inventor; 27 Aug 04; 102 pp.; In English
Patent Info.: Filed Filed 27 Aug 04; US-Patent-Appl-SN-10-928 929
Report No.(s): PB2007-105914; No Copyright; Avail.: CASI: A06, Hardcopy

The present invention provides novel coordination complexes, methods for synthesizing and identifying coordination complexes using combinatorial techniques, and assaying for their activity. In certain embodiments, the subject coordination complexes contain platinum.
NTIS
Assaying; Combinatorial Analysis; Coordination

20070024732 Ross (Sheridan) PC, Denver, CO, USA
Cysteine Variants of Beta Interferon
Cox, G. N., Inventor; 2 Mar 05; 45 pp.; In English
Contract(s)/Grant(s): 1R43NS040205; 2R44N5040205
Patent Info.: Filed Filed 2 Mar 05; US-Patent-Appl-SN-11-090 993
Report No.(s): PB2007-105905; No Copyright; Avail.: CASI: A03, Hardcopy

The growth hormone supergene family comprises greater than 20 structurally related cytokines and growth factors. A general method is provided for creating site-specific, biologically active conjugates of these proteins. The method involves adding cysteine residues to non-essential regions of the proteins or substituting cysteine residues for non-essential amino acids in the proteins using site-directed mutagenesis and then covalently coupling a cysteine-reactive polymer or other type of cysteine-reactive moiety to the proteins via the added cysteine residue. Disclosed herein are preferred sites for adding cysteine residues or introducing cysteine substitutions into the proteins, and the proteins and protein derivatives produced thereby.
NTIS
Cysteine; Interferon; Proteins

20070024738 Office of Naval Research, Washington, DC, USA
Micro Scale Flow through Sorbent Plate Collection Device
Houser, E., Inventor; McGill, R. A., Inventor; Nagel, D., Inventor; 10 Jun 04; 24 pp.; In English
Contract(s)/Grant(s): N00173022C002
Patent Info.: Filed Filed 10 Jun 04; US-Patent-Appl-SN-10-868 445
Report No.(s): PB2007-105894; No Copyright; Avail.: CASI: A03, Hardcopy

In the invention, a collection device includes a first micro scale plate having a sorbent surface and a through hole. The through hole provides for the passage of an analyte fluid flow through the plate, and it has a volume and geometry to provide contact between the fluid and the sorbent surface in an amount effective to absorb a sufficient amount of analyte for subsequent detection of the analyte. The sorbent surface can be provided by a sorbent coating such as an active sensing film, e.g. a conducting or optically active material, examples of which include conducting polymers, polymer/carbon composites, carbon

nanotubes, and dye-containing materials. The analyte collection device preferably includes a heating source, e.g. a heating element formed from a resistive trace, or a plurality of resistive traces, on or within the first microscale plate, for effecting a thermal release of collected analyte from the plate.
NTIS
Sorbents; Fluid Flow; Plates (Structural Members)

20070024743 Air Products and Chemicals, Inc., Allentown, PA, USA
Overcharge Protection for Electrochemical Cells
Amine, K., Inventor; Liu, J., Inventor; Jambunathan, K., Inventor; Peterson, B. K., Inventor; Dantsin, G., Inventor; 1 Apr 05; 16 pp.; In English
Contract(s)/Grant(s): ANL85N14
Patent Info.: Filed Filed 1 Apr 05; US-Patent-Appl-SN-11-097 810
Report No.(s): PB2007-105882; No Copyright; Avail.: CASI: A03, Hardcopy

The invention relates to an improvement in a cell which is normally susceptible to damage from overcharging comprised of a negative electrode, a positive electrode, and an electrolyte comprised of an overcharge protection salt carried in a carrier or solvent. Representative overcharge protection salts are embraced by the formula: M(sub a)Q where M is an electrochemically stable cation selected from the group consisting of alkali metal, alkaline earth metal, tetraalkylammonium, or imidazolium groups, and Q is a borate or heteroborate cluster and a is the integer 1 or 2.
NTIS
Electrochemical Cells; Protection; Charge Efficiency

20070024750 Oblon, Spivak, McClelland, Maier and Neustadt, P.C., Alexandria, VA, USA, Research Triangle Inst., Research Triangle Park, NC USA
Electrospinning in a Controlled Gaseous Environment
Andrady, A. L., Inventor; Ensor, D. S., Inventor; 8 Apr 04; 14 pp.; In English
Contract(s)/Grant(s): 97201C0058
Patent Info.: Filed Filed 8 Apr 04; US-Patent-Appl-SN-10-819 945
Report No.(s): PB2007-105873; No Copyright; Avail.: CASI: A03, Hardcopy

Apparatus and method for producing fibrous materials in which the apparatus includes an extrusion element configured to electrospin a substance from which the fibers are to be composed by an electric field extraction of the substance from a tip of the extrusion element, a collector disposed from the extrusion element and configured to collect the fibers, a chamber enclosing the collector and the extrusion element, and a control mechanism configured to control a gaseous environment in which the fibers are to be electrospun. The method includes providing a substance from which the fibers are to be composed to a tip of an extrusion element, applying an electric field to the extrusion element in a direction of the tip, controlling a gaseous environment about where the fibers are to be electrospun, and electrospinning the substance from the tip of the extrusion element by an electric field extraction of the substance from the tip into the controlled gaseous environment.
NTIS
Gases; Electron Spin; Electric Fields

20070024751 DLA, Piper, Rudnick, Gray, and Cary, LLP, San Diego, CA, USA, California Inst. of Tech., Pasadena, CA USA
Enzyme-Free Isothermal Exponential Amplification of Nucleic Acids and Nucleic Acid Analog Signals
Zhang, D., Inventor; Yurke, B., Inventor; Winfree, E., Inventor; 9 Dec 04; 31 pp.; In English
Contract(s)/Grant(s): EIA0093486
Patent Info.: Filed Filed 9 Dec 04; US-Patent-Appl-SN-11-009 386
Report No.(s): PB2007-105917; No Copyright; Avail.: CASI: A03, Hardcopy

An enzyme-free, isothermal method of generating an amplification signal indicative of a target nucleic acid molecule is provided, as are compositions for performing such a method. An advantage of the detection system is that it is very sensitive, and can allow for the detection of a single target molecule in a sample.
NTIS
Amplification; Analog Data; Enzymes; Nucleic Acids

20070024770 National Renewable Energy Lab., Golden, CO USA
Characterization of a Dominant Electron Trap in GaNAs Using Deep-Level Transient Spectroscopy
Johnston, S. W.; Kurtz, S. R.; Crandall, R. S.; Aug. 2006; 9 pp.; In English
Report No.(s): DE2007-899474; NREL/CP-520-38334; No Copyright; Avail.: Department of Energy Information Bridge

Dilute-nitrogen GaNAs epitaxial layers grown by metal-organic chemical vapor deposition were characterized by deep-level transient spectroscopy (DLTS). For all samples, the dominant DLTS signal corresponds to an electron trap having an activation energy of about 0.25 to 0.35 eV. The minority-carrier trap density in the p-type material is quantified based on computer simulation of the devices. The simulations show that only about 2% of the traps in the depleted layer are filled during the transient. The fraction of the traps that are filled depends strongly on the depth of the trap, but only weakly on the doping of the layers and on the conduction-band offset. The simulations provide a pathway to obtain semi-quantitative data for analysis of minority-carrier traps by DLTS.

NTIS
Gallium Arsenides; Epitaxy; Photovoltaic Conversion

20070024771 Lawrence Livermore National Lab., Livermore, CA USA
Simple Common Plane Contact Algorithm for Explicit FE/FD Methods
Vorobiev, O.; Jan. 05, 2007; 26 pp.; In English
Report No.(s): DE2007-899442; UCRL-TR-227085; No Copyright; Avail.: National Technical Information Service (NTIS)

Common-plane (CP) algorithm is widely used in Discrete Element Method (DEM) to model contact forces between interacting particles or blocks. A new simple contact algorithm is proposed to model contacts in FE/FD methods which is similar to the CP algorithm. The CP is defined as a plane separating interacting faces of FE/FD mesh instead of blocks or particles used in the original CP method. The new method does not require iterations even for very stiff contacts. It is very robust and easy to implement both in 2D and 3D parallel codes.

NTIS
Algorithms; Plane Waves; Grid Generation (Mathematics)

20070024816 Cleveland State Univ., Cleveland, OH, USA
High Resistivity Transparent/Conductive Coatings for Space Applications: Problems and Possible Improvements
Cashman, Thomas; Demko, Rikako; Uppala, Nischala; Vemulapalli, Jyothi; Welch, Bryan; Hambourger, Paul D.; Vacuum Technology and Coating; September 2003, pp. 39-43; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-740; NCC3-1023; NCC3-1033; Copyright; Avail.: Other Sources

We have prepared transparent films with a sheet relativity of 10(exp 1) to 10(exp 12) ohm/square by co-depositing a transparent conducting oxide (TCO) with magnesium fluoride, using two independently controlled RF magnetron sputter guns to facilitate adjustment of the film composition, Co-deposited indium tin oxide (ITO) and MgF2 on quartz and flexible polymeric substrate exhibited reasonably stable sheet resistivity over several months' time, with substantially lower optical reflectance than that of pure ITO. However, exposure to low-intensity blue light reduces sheet resistivity by as much as two orders of magnitude. Our results suggest this photoconductivity effect may be present in all InO(x)-based materials. We find that sheet resistivity can by 'tuned' by admitting a small amount of high-purity air during deposition offering the possibility of closed loop process control.

Author
Coatings; Electrical Resistivity; Metal Oxides; Photoconductivity; Electrostatic Charge; Earth Orbital Environments

20070024826 Scripps Institution of Oceanography, La Jolla, CA, USA
Controls on Gas Hydrate Formation and Dissociation
Kastner, M.; MacDonald, I.; Mar. 03, 2006; 31 pp.; In English
Contract(s)/Grant(s): FC26-02NT41328
Report No.(s): DE2007-898807; No Copyright; Avail.: National Technical Information Service (NTIS)

The main objectives of the project were to monitor, characterize, and quantify in situ the rates of formation and dissociation of methane hydrates at and near the seafloor in the northern Gulf of Mexico, with a focus on the Bush Hill seafloor hydrate mound; to record the linkages between physical and chemical parameters of the deposits over the course of one year, by emphasizing the response of the hydrate mound to temperature and chemical perturbations; and to document the seafloor and water column environmental impacts of hydrate formation and dissociation. For these, monitoring the dynamics of gas hydrate formation and dissociation was required. The objectives were achieved by an integrated field and laboratory scientific

study, particularly by monitoring in situ formation and dissociation of the outcropping gas hydrate mound and of the associated gas-rich sediments. In addition to monitoring with the MOSQUITOs, fluid flow rates and temperature, continuously sampling in situ pore fluids for the chemistry, and imaging the hydrate mound, pore fluids from cores, peepers and gas hydrate samples from the mound were as well sampled and analyzed for chemical and isotopic compositions. In order to determine the impact of gas hydrate dissociation and/or methane venting across the seafloor on the ocean and atmosphere, the overlying seawater was sampled and thoroughly analyzed chemically and for methane C isotope ratios.
NTIS
Gas Dissociation; Hydrates; Ocean Bottom; Methane

20070024847 Georgia Tech Research Inst., Atlanta, GA, USA
Integrated Approach to Modeling and Mitigating SOFC Failure
Qu, J.; Fedorov, A.; Haynes, C.; May 15, 2003; 157 pp.; In English
Contract(s)/Grant(s): FC26-02NT41571
Report No.(s): DE2007-898813; No Copyright; Avail.: National Technical Information Service (NTIS); Abstract Only

The specific objectives of this project were: (1) To develop and demonstrate the feasibility of an integrated predictive computer-based tool for fuel cell design and reliability/durability analysis, (2) To generate new scientific and engineering knowledge to better enable SECA Industry Teams to develop reliable, low-cost solid-oxide fuel cell power generation systems, (3) To create technology breakthroughs to address technical risks and barriers that currently limit achievement of the SECA performance and cost goals for solidoxide fuel cell systems, and (4) To transfer new science and technology developed in the project to the SECA Industry Teams. Through this three-year project, the Georgia Tech's team has demonstrated the feasibility of the solution proposed and the merits of the scientific path of inquiry, and has developed the technology to a sufficient level such that it can be utilized by the SECA Industry Teams. This report summarizes the project's results and achievements.
NTIS
Failure; Models; Solid Oxide Fuel Cells

20070024886 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Workers' Exposures to n-Propyl Bromide at an Adhesives and Coatings Manufacturer
Hanley, K. W.; Dunn, K.; Johnson, B.; Mar. 2007; 24 pp.; In English
Report No.(s): PB2007-108706; IWSB-232-16; No Copyright; Avail.: CASI: A03, Hardcopy

The National Institute for Occupational Safety and Health (NIOSH) conducted a field study at an adhesive and coating manufacturing plant where n-propyl bromide (nPB) was used as a solvent carrier. Workers' breathing zone, and exhaled breath concentrations of nPB and isopropyl bromide (iPB) were measured on two consecutive days, as were urinary metabolite concentrations of bromide (Br) and propyl mercapturic acid (PMA). n-Propyl bromide has been marketed to replace ozone depleting solvents 1,1, 1-trichloroethane and freons, as well as suspect carcinogens trichloroethylene and methylene chloride; chemicals commonly used in industry. Sparse data are currently available to evaluate human exposure to nPB. However, there is concern that nPB may be a hematological, reproductive, or neurological toxin, based on analogy to other brominated-propanes, animal studies, and a few case studies.
NTIS
Adhesives; Bromides; Coating; Exposure; Health; Personnel; Safety

20070024909 Federal Bureau of Investigation Academy, Quantico, VA, USA
Federal Bureau of Investigation Laboratory 2005 Report
January 2005; 64 pp.; In English
Report No.(s): PB2007-109525; FBI-PUB-0357-2005; No Copyright; Avail.: CASI: A04, Hardcopy

Investigations and intelligence gathering are the lifeblood of the FBI, and the FBI Laboratory supports those efforts. FBI Laboratory personnel routinely examine evidence from major cases, as well as other cases you may never read about in the newspaper. Whether the case is big or small, just around the corner or halfway around the world, the FBI Laboratory approaches each one with the same steadfast determination and desire to be the worlds foremost forensic laboratory upon which FBI field offices, investigative and intelligence agencies, and the American public can always rely. In 2005 our

commitment to quality led to a restructuring of the Laboratory. The reorganization involved placing the Quality Assurance and Training Unit under the authority of the Deputy Assistant Director of the Forensic Analysis Branch. The Quality Assurance Manager, who heads the unit, now reports directly to the Laboratory Director.
NTIS
Law (Jurisprudence); Quality Control

20070024943 Sandia National Labs., Albuquerque, NM USA
Nanotube Cathodes
Miller, P. A.; Siegal, M. P.; Overmyer, D. L.; Lockner, T. R.; Nov. 2006; 29 pp.; In English
Report No.(s): DE2007-899358; SAND2006-7002; No Copyright; Avail.: National Technical Information Service (NTIS)

Carbon nanotubes have shown promise for applications in many diverse areas of technology. In this report we describe our efforts to develop high-current cathodes from a variety of nanotubes deposited under a variety of conditions. Our goal was to develop a one-inch-diameter cathode capable of emitting 10 amperes of electron current for one second with an applied potential of 50 kV. This combination of current and pulse duration significantly exceeds previously reported nanotube-cathode performance. This project was planned for two years duration. In the first year, we tested the electron-emission characteristics of nanotube arrays fabricated under a variety of conditions. In the second year, we planned to select the best processing conditions, to fabricate larger cathode samples, and to test them on a high-power relativistic electron beam generator.
NTIS
Carbon Nanotubes; Cathodes; High Current; Nanotubes

20070024984 Hi-Z Technology, Inc., San Diego, CA, USA
Quantum Well Thermoelectrics for Converting Waste Heat to Electricity
January 2006; 12 pp.; In English
Contract(s)/Grant(s): DE-FC26-03NT41974
Report No.(s): DE2007-899167; No Copyright; Avail.: Department of Energy Information Bridge

The goal in this project is to produce the technology for fabricating a basic 10-20 watt module that can be used to build up any size generator such as: a 5-10 kW Auxiliary Power Unit (APU), a multi kW Waste Heat Recovery Generator (WHRG) for a class 8 truck or as small as a 10-20 watt unit that would fit on a daily used wood fired stove and allow some of the estimated 2-3 billion people on earth, who have no electricity, to recharge batteries (such as a cell phone) or directly power radios, TVs, computers and other low powered devices.
NTIS
Electricity; Quantum Wells; Sputtering; Thermoelectric Materials; Waste Energy Utilization; Waste Heat

20070024999 Rhode Island Univ., Kingston, RI, USA
Effects of Road Marking Luminance Contrast on Driving Safety
Wang, J. H.; Cao, Y.; May 2004; 128 pp.; In English
Contract(s)/Grant(s): SPR-227-2263
Report No.(s): PB2007-108539; No Copyright; Avail.: National Technical Information Service (NTIS)

This report presents a study on the effects of road marking luminance contrast on driving safety. Through laboratory driving simulation experiments, road marking color, configuration, luminance contrast, driving speed, subjects age and gender, and their interactions, were investigated. Thirty-six subjects balanced by age and gender participated in the experiments. Each subject was presented with a series of digitally edited video clips showing different levels of marking luminance contrasts. The subject was required to make responses to the video stimuli based on marking color and configuration the video presented. It found that subjects responses dropped with the increment of road marking luminance contrast values, but at different rates during different contrast segments. White markings are more visible than yellow markings. Driving at higher speed got faster responses but longer response distances. Older subjects took the longest responses while younger subjects took the least. Female subjects responded a little bit slower and needed longer response distances than males. To warrant proper responses and assure safe driving, the minimum contrast values for white and yellow road marking are estimated to be 1.1 and 3.3-3.5 respectively. When road markings contrast values are below these thresholds, a repair or repaint on road markings might be needed.
NTIS
Experiment Design; Human Factors Engineering; Luminance; Roads; Safety

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COMPOSITE MATERIALS

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

20070023724 NASA Langley Research Center, Hampton, VA, USA, National Inst. of Aerospace, Hampton, VA, USA
Analysis of Composite Panel-Stiffener Debonding Using a Shell/3D Modeling Technique
Krueger, Ronald; Ratcliffe, James; Minguet, Pierre J.; June 2007; 64 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS1-02117; DAAH10-02-2-0001; WBS 698259.02.07.07
Report No.(s): NASA/CR-2007-214879; NIA Report 2007-07; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023724

Interlaminar fracture mechanics has proven useful for characterizing the onset of delaminations in composites and has been used successfully primarily to investigate onset in fracture toughness specimens and laboratory size coupon type specimens. Future acceptance of the methodology by industry and certification authorities, however, requires the successful demonstration of the methodology on the structural level. For this purpose, a panel was selected that is reinforced with stiffeners. Shear loading causes the panel to buckle, and the resulting out-of-plane deformations initiate skin/stiffener separation at the location of an embedded defect. A small section of the stiffener foot, web and noodle as well as the panel skin in the vicinity of the delamination front were modeled with a local 3D solid model. Across the width of the stiffener foot, the mixedmode strain energy release rates were calculated using the virtual crack closure technique. A failure index was calculated by correlating the results with a mixed-mode failure criterion of the graphite/epoxy material. Computed failure indices were compared to corresponding results where the entire web was modeled with shell elements and only a small section of the stiffener foot and panel were modeled locally with solid elements. Including the stiffener web in the local 3D solid model increased the computed failure index. Further including the noodle and transition radius in the local 3D solid model changed the local distribution across the width. The magnitude of the failure index decreased with increasing transition radius and noodle area. For the transition radii modeled, the material properties used for the noodle area had a negligible effect on the results. The results of this study are intended to be used as a guide for conducting finite element and fracture mechanics analyses of delamination and debonding in complex structures such as integrally stiffened panels.
Author
Composite Structures; Debonding (Materials); Panels; Three Dimensional Models; Shells (Structural Forms); Stiffness

20070024452 Dachs (Louis L.), Pacific Palisades, CA, USA
Process for the Manufacture of Composite Structures
Yen, Anna, Inventor; Bohlen, James Winter, Inventor; 16 Jun. 2005; 6 pp.; In English
Contract(s)/Grant(s): NRA8-30
Patent Info.: Filed 15 Dec .2003; US-Patent-Appl-10/736479; US 2005/0126699
Report No.(s): PB2007-102545; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024452

The invention is a process for making a composite structure having a honeycomb core and face sheets using vacuum bagging techniques without the use of an autoclave. In detail, the process includes the following steps: (1) forming a preform sandwich assembly having previously de-bulked cover sheets impregnated with a fiber-reinforced resin having a first curing temperature, a honeycomb core and sheets of adhesive between the cover sheets and core, the first layer of adhesive having a second curing temperature less than the first curing temperature; (2) vacuum bagging the preform and drawing a vacuum; (3) initially heating the vacuum bagged preform at a heating rate of between 0.5 degree and 2 degrees per minute until the gel temperature of said adhesive is reached; (4) holding the temperature at the gel temperature until the layer of adhesive has cured; (5) raising the temperature to the first curing temperature of the fiber-reinforced resin; and (6) maintaining the temperature at the first curing temperature until the fiber-reinforced resin has cured.
Official Gazette of the U.S. Patent and Trademark Office
Composite Structures; Manufacturing

20070024689 Daly, Crowley and Mofford, LLP, Canton, MA, USA
High Strength, Long Durability Structural Fabric/Seam System
Elsworth, S. A., Inventor; Fredberg, M. I., Inventor; Fossey, W. H., Inventor; Press, S., Inventor; Fredrickson, T. H., Inventor; 5 Feb 04; 7 pp.; In English
Contract(s)/Grant(s): DOD-HQ006-01-C-001

Patent Info.: Filed Filed 5 Feb 04; US-Patent-Appl-SN-10-773-125
Report No.(s): PB2007-102597; No Copyright; Avail.: CASI: A02, Hardcopy

A high strength, high modulus structural fabric product and the method of manufacturing the product are disclosed. The incorporation of a specific fiber/fabric treatment coupled with a resin impregnation and coating process produces a composite material. This composite material comprises high strength and modulus fibers embedded in and linked to a matrix. The resulting fabric product is useable in the formation of seamed structures, which carry and distribute high-level loads under extreme environmental conditions.

NTIS

Composite Materials; Durability; Fabrics; High Strength; Seams (Joints)

20070025083 NASA White Sands Test Facility, NM, USA

Good Laboratory Practices of Materials Testing at NASA White Sands Test Facility

Hirsch, David; Williams, James H.; April 04, 2005; 11 pp.; In English; NASA/JAXA Technical Interchange Meeting, 4-8 Apr. 2005, Tsukuba, Japan; Copyright; Avail.: CASI: A03, Hardcopy

An approach to good laboratory practices of materials testing at NASA White Sands Test Facility is presented. The contents include: 1) Current approach; 2) Data analysis; and 3) Improvements sought by WSTF to enhance the diagnostic capability of existing methods.

Derived from text

Materials Tests; Methodology; Aerospace Engineering

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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*.

20070023795 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Development of a Screening Model for Design and Costing of an Innovative Tailored Granular Activated Carbon Technology to Treat Perchlorate-Contaminated Water

Powell, William C; Mar 2007; 144 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465968; AFIT/GEM/ENV/07-M12; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465968

Perchlorate contamination of drinking water is a problem that has recently gained national attention. The purpose of this research was to develop a tool to predict the cost and performance of tailored granular activated carbon (T-GAC), an innovative technology to treat perchlorate-contaminated water. The ability to predict cost and performance is essential to promote transfer and commercialization of innovative technologies. This study investigated how data obtained from small-scale laboratory tests could be applied to predict cost and performance of a full-scale T-GAC system to treat perchlorate-contaminated water. A technology model was developed using GAC design principles and using a multi-component Freundlich isotherm to describe sorption of perchlorate on T-GAC, in the presence of competing anions. Data from laboratory column experiments were used to obtain model parameters. Cost data used in the model were based on conventional GAC installations, as modified to account for the benefits of T-GAC in treating perchlorate-contaminated water. Application of the model showed that performance and cost of a T-GAC system is very sensitive to the presence of competing ions. T-GAC appears to be a viable technology to treat perchlorate-contaminated water when the perchlorate concentrations are low and competing ion concentrations are not significant.

DTIC

Activated Carbon; Contamination; Cost Estimates; Ground Water; Models; Perchlorates; Sorption; Water; Water Treatment

20070023956 Aerospace Corp., El Segundo, CA USA

Measurements and Modeling of SiCl(4) Combustion in a Low-Pressure H2/O2 Flame

Moore, T; Brady, B; Martin, L R; Nov 10, 2006; 28 pp.; In English
Contract(s)/Grant(s): FA8802-04-C-0001
Report No.(s): AD-A465829; AR-TR-2006(8565)-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465829

Laser-Induced Fluorescence (LIF) was used to measure temperature and OH concentration profiles as a function of

distance from a McKenna-style burner in premixed, one-dimensional, low-pressure H2/O2/Ar SiCl4-doped flames. The addition of SiCl4 was shown to affect the flame temperature and OH concentration profiles. A gas-phase chemical kinetics mechanism for the combustion of SiCl in an H2/O2/Ar flame was proposed, and experimental results were compared with predictions for a premixed, one-dimensional laminar flame model based on CHEMKIN. The low-pressure flame data are sensitive to the overall kinetics of the mechanism. In order to obtain the best fit to the observed data for all flame configurations, we had to modify% six different rates from our original estimates. None of the modified rates are well known for the temperature regime of our flame. Particle formation and surface chemistry were not taken into account.
DTIC
Chemical Reactions; Combustion Chemistry; Flames; Hydrogen; Laser Induced Fluorescence; Low Pressure; Oxygen; Reaction Kinetics; Silicon; Surface Reactions

20070024431 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Measurements of Line Positions and Strengths of HD O-18 and D2 O-18 in the 2500-4280 cm(exp -1) Region
Toth, Robert A.; Journal of Molecular Structure; February 23, 2005; ISSN 0022-2860; Volume 742, pp. 49-68; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40081; http://dx.doi.org/10.1016/j.molstruc.2004.09.035

Measurements of line positions and strengths of D2 O-18 and HD O-18 were obtained with a Fourier transform spectrometer. The data were analyzed to obtain energy levels of the (100), (020), and (001) vibrational states of HD O-18 and the (001) and (011) states of D2 O-18 and the vibrational bands of these states connected to the ground state covered the spectral region from 2500 to 4278 cm(exp -1). 456 absorption lines of D2 O-18 and 856 lines of HD O-18 were assigned from the spectra. The measurements were of oxygen-18 enriched samples of deuterated water vapor and the spectra also contained features of HD O-16, D2 O-16, H2 O-16, H2 O-17 and H2 O-18 of which several were used as frequency calibration standards.
Author
Deuterium Compounds; Line Spectra; Oxygen 18; Infrared Spectroscopy; Oxygen 17; Water Vapor

20070024736 Quallion, LLC, Sylmar, CA, USA
Electrochemical Device Having Electrolyte Including Disiloxane
West, R. C., Inventor; Amine, K., Inventor; Zhang, Z., Inventor; Wang, O., Inventor; Antionio, N. A., Inventor; 21 Oct 04; 26 pp.; In English
Contract(s)/Grant(s): NIST-70NANB043022; DE-W-31-109-ENG-38
Patent Info.: Filed Filed 21 Oct 04; US-Patent-Appl-SN-10-971-507
Report No.(s): PB2007-104223; No Copyright; Avail.: CASI: A03, Hardcopy

One example of the disiloxanes include a backbone with a first silicon and a second silicon. The first silicon is linked to a first substituent selected from a group consisting of: a first side chain that includes a cyclic carbonate moiety; a first side chain that includes a poly(alkylene oxide) moiety; and a first cross link links the disiloxane to a second siloxane and that includes a poly(alkylene oxide) moiety. In some instance, the second silicon is linked to a second substituent selected from a group consisting of: a second side chain that includes a cyclic carbonate moiety, and a second side chain that includes a poly(alkylene oxide) moiety.
NTIS
Electrolytes; Patent Applications

20070024779 Lawrence Livermore National Lab., Livermore, CA USA
Analysis of Samples for the ICTAC Lifetime-Prediction Round-Robin Exercise
Burnham, A. K.; May 23, 2006; 42 pp.; In English
Report No.(s): DE2007-899384; UCRL-TR-221563; No Copyright; Avail.: National Technical Information Service (NTIS)

Derivation of chemical kinetic models for prediction of material and component lifetimes is of broad interest and value. This work analyzes data that was distributed to me, among others, by the International Confederation for Thermal Analysis and Calorimetry (ICTAC) as part of a blind study of kinetic analysis. The results from this report will be combined with results from other parties to create a broader comparison of kinetic analysis methods. In addition to the eight ICTAC data sets, which appear to contain one set of simulated data, presumably for ground truth comparison, I created an additional simulated data set to compare the reliability of isoconversional and model-fitting approaches. It is usually possible to fit the data well with both isoconversional and model fitting approaches, although the isoconversional method is usually faster and provides better

fits to the data, particularly for complex reaction profiles. The two methods often, but not always, give similar predictions. Predictions of the isoconversional model will fail to the extent that the reaction contains competitive or crossing-concurrent reaction characteristics.
NTIS
Kinetics; Predictions; Models; Propellants; Chemical Analysis

20070024780 Lawrence Livermore National Lab., Livermore, CA USA, Russian Federal Nuclear Center, Sarov, Russian Federation, Los Alamos National Lab., NM USA, RAN Ural'skoe Otdelenie, Ekaterinburg, Russia
6th US-Russian Pu Science Workshop Lawrence Livermore National Laboratory University of California, Livermore, California, July 14 and 15, 2006
Fluss, M.; Tobin, J.; Schwartz, A.; Petrovtsev, A. V.; Nadykto, B. A.; Jun. 20, 2006; 86 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898505; UCRL-PROC-222407; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Radiochemistry; Plutonium; Fissionable Materials; Nuclear Fuels

20070024878 Florida Atlantic Univ., Dania Beach, FL, USA, Lankard Materials Lab., Inc., Columbus, OH USA
Utility of High Alkalinity Cements for Control of Reinforcing Steel Corrosion in Concrete
Hartt, W. H.; Suarez, J. A.; Lankard, D. R.; Mar. 2007; 188 pp.; In English
Contract(s)/Grant(s): BD-564-1
Report No.(s): PB2007-108755; No Copyright; Avail.: National Technical Information Service (NTIS)
Corrosion induced deterioration of reinforced concrete bridge substructures in Florida coastal waters has been recognized for decades as a conditioning maintenance problem. Such distress arises as a consequence of (1) progressive chloride intrusion into the concrete over time, (2) localized breakdown of the otherwise protective passive film upon embedded reinforcing steel once chlorides achieve a critical concentration at the steel depth, (3) corrosion of the steel at a rate controlled by oxygen and moisture availability, and (4) cracking and spalling of the concrete cover from tensile hoop stresses generated in the concrete abut the reinforcement by expansive corrosion products. Unaddressed, these processes can lead to structural failure if either the reinforcement or concrete cross section (or both) become sufficiently reduced. The objective of the project was to investigate a previously unaddressed option for mitigating corrosion induced bridge substructure deterioration and thereby extend service life of new structures through improved concrete mix design and materials selection.
NTIS
Alkalinity; Cements; Composite Materials; Concretes; Corrosion; Corrosion Prevention; Steels

20070024881 Government Accountability Office, Washington, DC, USA
Defense Management: High-Level Leadership Commitment and Actions Are Needed to Address Corrosion Issues
Apr. 2007; 39 pp.; In English
Report No.(s): PB2007-108734; GAO-07-618; No Copyright; Avail.: CASI: A03, Hardcopy
Corrosion can have a deleterious effect on military equipment and infrastructure in terms of cost, readiness, and safety. Recognizing this concern, the Bob Stump National Defense Authorization Act of Fiscal Year 2003 required the Department of Defense (DOD) to designate an official or organization to oversee and coordinate efforts to prevent and mitigate corrosion. Recently, the National Defense Authorization Act of Fiscal Year 2006 directed GAO to examine the effectiveness of DOD's corrosion prevention and mitigation programs. In addition, GAO evaluated the extent to which DOD has incorporated corrosion prevention planning in acquiring weapon systems. GAO reviewed strategy documents, reviewed corrosion prevention planning for 51 recent major weapon system acquisitions, and interviewed DOD and military service officials.
NTIS
Corrosion; Leadership; Management Planning

20070024889 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Workers' Exposures to n-Propyl Bromide at a Printed Electronics Circuit Assembly Manufacturer
Hanley, K. W.; Johnson, B.; Feb. 2007; 23 pp.; In English
Report No.(s): PB2007-108704; IWSB-232-14; No Copyright; Avail.: CASI: A03, Hardcopy
The National Institute for Occupational Safety and Health (NIOSH) conducted a field study at a electronic printed circuit

assembly manufacturing plant where n-propyl bromide (nPB) was used as a vapor de greasing and liquid cleaning solvent. Workers' breathing zone, and exhaled breath concentrations of nPB and isopropyl bromide (iPB) were measured on two consecutive days, as were urinary metabolite concentrations of bromide (Br) and propyl mercapturic acid (PMA). n-Propyl bromide has been marketed to replace ozone depleting solvents 1,1,1-trichloroethane and freons, as well as suspect carcinogens trichloroethylene and methylene chloride; chemicals commonly used in industry. Sparse data are currently available to evaluate human exposure to nPB. However, there is concern that nPB may be a hematological, reproductive, or neurological toxin, based on analogy to other Br-propanes, animal studies, and a few case studies.
NTIS
Bromides; Exposure; Health; Personnel; Printed Circuits; Safety

20070024890 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Workers' Exposures to n-Propyl Bromide at an Optical Prism and Optical Assemblies Manufacturer
Hanley, K. W.; Dunn, K.; Feb. 2007; 23 pp.; In English
Report No.(s): PB2007-108705; IWSB-232-15; No Copyright; Avail.: CASI: A03, Hardcopy

The National Institute for Occupational Safety and Health (NIOSH) conducted a field study at a prism and optical assembly manufacturing plant where n-propyl bromide (nPB) was used as a vapor de greasing solvent. Workers' breathing zone, and exhaled breath concentrations of nPB and isopropyl bromide (iPB) were measured on two consecutive days, as were urinary metabolite concentrations of bromide (Br) and propyl mercapturic acid (PMA). n-Propyl bromide has been marketed to replace ozone depleting solvents 1,1,1-trichloroethane and freons, as well as suspect carcinogens trichloroethylene and methylene chloride; chemicals commonly used in industry. Sparse data are currently available to evaluate human exposure to nPB. However, there is concern that nPB may be a hematological, reproductive, or neurological toxin, based on analogy to other Br-propanes, animal studies, and a few case studies.
NTIS
Bromides; Exposure; Health; Manufacturing; Personnel; Prisms; Safety

20070024893 National Inst. for Occupational Safety and Health, Cincinnati, OH, USA
Workers' Exposures to n-Propyl Bromide at a Hydraulic Power Control Component Manufacturer
Hanley, K. W.; Johnson, B.; Feb. 2007; 26 pp.; In English
Report No.(s): PB2007-108703; IWSB-232-13; No Copyright; Avail.: CASI: A03, Hardcopy

The National Institute for Occupational Safety and Health (NIOSH) conducted a field study at a hydraulic power control components manufacturing plant where n-propyl bromide (nPB) was used as a vapor de greasing solvent. Workers' breathing zone, 'in-mask' respirator, and exhaled breath concentrations of nPB and isopropyl bromide (iPB) were measured as were urinary metabolite concentrations of bromide (Br) and propyl mercapturic acid (PMA). n-Propyl bromide has been marketed to replace ozone depleting solvents 1,1,1-trichloroethane and freons, as well as suspect carcinogens trichloroethylene and methylene chloride; chemicals commonly used in industry. Sparse data are currently available to evaluate human exposure to nPB. However, there is concern that nPB may be a hematological, reproductive, or neurological toxin, based on analogy to other Br-propanes, animal studies, and a few case studies.
NTIS
Bromides; Exposure; Hydraulic Control; Personnel

20070024900 Gas Technology Inst., Des Plaines, IL, USA, Nanoscale Materials, Inc., Manhattan, KS, USA
Development and Evaluation of Nanoscale Sorbents for Mercury Capture from Warm Fuel Gas
Jadhav, R. A.; Aug. 25, 2006; 44 pp.; In English
Contract(s)/Grant(s): DE-FC26-04NT42312
Report No.(s): DE2007-898111; No Copyright; Avail.: Department of Energy Information Bridge

Several different types of nanocrystalline metal oxide sorbents were synthesized and evaluated for capture of mercury (Hg) from coal-gasifier warm fuel gas. Detailed experimental studies were carried out to understand the fundamental mechanism of interaction between mercury and nanocrystalline sorbents over a range of fuel gas conditions. The metal oxide sorbents evaluated in this work included those prepared by GTIs subcontractor NanoScale Materials, Inc. (NanoScale) as well as those prepared in-house. These sorbents were evaluated for mercury capture in GTIs Mercury Sorbent Testing System. Initial experiments were focused on sorbent evaluation for mercury capture in N2 stream over the temperature range 423533 K. These exploratory studies demonstrated that NanoActive Cr2O3 along with its supported form was the most active of the sorbent evaluated. The capture of Hg decreased with temperature, which suggested that physical adsorption was the dominant

mechanism of Hg capture. Desorption studies on spent sorbents indicated that a major portion of Hg was attached to the sorbent by strong bonds, which suggested that Hg was oxidized by the O atoms of the metal oxides, thus forming a strong HgO bond with the oxide. Initial screening studies also indicated that sulfided form of CuO/alumina was the most active for Hg capture, therefore was selected for detailed evaluation in simulated fuel gas (SFG). It was found that such supported CuO sorbents had high Hg-sorption capacity in the presence of H2, provided the gas also contained H2S. Exposure of supported CuO sorbent to H2S results in the formation of CuS, which is an active sorbent for Hg capture. Sulfur atom in CuS forms a bond with Hg that results into its capture. Although thermodynamically CuS is predicted to form unreactive Cu2S form when exposed to H2, it is hypothesized that Cu atoms in such supported sorbents are in dispersed form, with two Cu atoms separated by a distance longer than required to form a Cu2S molecule. Thus CuS remains in the stable reactive form as long as H2S is present in the gas phase. It was also found that the captured Hg on such supported sorbents could be easily released when the spent sorbent is exposed to a H2-containing stream that is free of Hg and H2S. Based on this mechanism, a novel regenerative process has been proposed to remove Hg from fuel gas at high temperature. Limited multicyclic studies carried out on the supported Cu sorbents showed their potential to capture Hg from SFG in a regenerative manner. This study has demonstrated that supported nanocrystalline Cu-based sorbents have potential to capture mercury from coal syngas over multiple absorption/regeneration cycles. Further studies are recommended to evaluate their potential to remove arsenic and selenium from coal fuel gas.
NTIS
Sorbents; Synthesis Gas; Coal Derived Gases; Metal Oxides; Sorption

20070024937 Sandia National Labs., Albuquerque, NM USA
Noncontact Surface Thermometry for Microsystems LDRD
Kearney, S. P.; Serrano, J. R.; Phinney, L. M.; Graham, S.; Beecham, T.; Oct. 2006; 86 pp.; In English
Report No.(s): DE2007-899367; SAND2006-6369; No Copyright; Avail.: National Technical Information Service (NTIS)

We describe a Laboratory Directed Research and Development (LDRD) effort to develop and apply laser-based thermometry diagnostics for obtaining spatially resolved temperature maps on working microelectromechanical systems (MEMS). The goal of the effort was to cultivate diagnostic approaches that could adequately resolve the extremely fine MEMS device features, required no modifications to MEMS device design, and which did not perturb the delicate operation of these extremely small devices. Two optical diagnostics were used in this study: microscale Raman spectroscopy and microscale thermoreflectance. Both methods use a low-energy, nonperturbing probe laser beam, whose arbitrary wavelength can be selected for a diffraction-limited focus that meets the need for micron-scale spatial resolution. Raman is exploited most frequently, as this technique provides a simple and unambiguous measure of the absolute device temperature for most any MEMS semiconductor or insulator material under steady state operation. Temperatures are obtained from the spectral position and width of readily isolated peaks in the measured Raman spectra with a maximum uncertainty near -10 K and a spatial resolution of about 1 micron. Application of the Raman technique is demonstrated for V-shaped and flexure-style polycrystalline silicon electrothermal actuators, and for a GaN high-electron-mobility transistor. The potential of the Raman technique for simultaneous measurement of temperature and inplane stress in silicon MEMS is also demonstrated and future Raman-variant diagnostics for ultra spatiotemporal resolution probing are discussed. Microscale thermoreflectance has been developed as a complement for the primary Raman diagnostic. Thermoreflectance exploits the small-but-measurable temperature dependence of surface optical reflectivity for diagnostic purposes. The temperaturedependent reflectance behavior of bulk silicon, SUMMiT-V polycrystalline silicon films and metal surfaces is presented. The results for bulk silicon are applied to silicon-on-insulator (SOI) fabricated actuators, where measured temperatures with a maximum uncertainty near -9 K, and 0.75-micron inplane spatial resolution, are achieved for the reflectance-based measurements. Reflectance-based temperatures are found to be in good agreement with Raman-measured temperatures from the same device.
NTIS
Diagnosis; Lasers; Temperature Measurement; Thermometers

20070024942 Geological Survey, Reston, VA USA
Heavy Oil and Natural Bitumen Resources in Geological Basins of the World
Meyer, R. F.; Attanasi, E. D.; Freeman, P. A.; January 2007; 42 pp.; In English
Report No.(s): PB2007-108554; USGS-OFR-2007-1084; No Copyright; Avail.: National Technical Information Service (NTIS)

Heavy oil and natural bitumen are oils set apart by their high viscosity (resistance to flow) and high density (low API gravity). These attributes reflect the invariable presence of up to 50 weight percent asphaltenes, very high molecular weight hydrocarbon molecules incorporating many heteroatoms in their lattices. Almost all heavy oil and natural bitumen are

alteration products of conventional oil. Total resources of heavy oil in known accumulations are 3,396 billion barrels of original oil in place, of which 30 billion barrels are included as prospective additional oil. The total natural bitumen resource in known accumulations amounts to 5,505 billion barrels of oil originally in place, which includes 993 billion barrels as prospective additional oil. This resource is distributed in 192 basins containing heavy oil and 89 basins with natural bitumen. Of the nine basic Klemme basin types, some with subdivisions, the most prolific by far for known heavy oil and natural bitumen volumes are continental multicyclic basins, either basins on the craton margin or closed basins along convergent plate margins. The former includes 47 percent of the natural bitumen, the latter 47 percent of the heavy oil and 46 percent of the natural bitumen. Little if any heavy oil occurs in fore-arc basins, and natural bitumen does not occur in either fore-arc or delta basins.
NTIS
Bitumens; Earth Resources; Oils; Structural Basins

20070024972 Sandia National Labs., Albuquerque, NM USA
Novel Modified Zeolites for Energy-Efficient Hydrocarbon Separations
Nenoff, T. M.; Ulutagay-Kartin, M.; Bennett, R.; Johnson, K.; Gray, G.; Nov. 2006; 29 pp.; In English
Report No.(s): DE2007-899372; SAND2006-6891; No Copyright; Avail.: National Technical Information Service (NTIS)
We present synthesis, characterization and testing results of our applied research project, which focuses on the effects of surface and skeletal modification of zeolites for significant enhancements in current hydrocarbon (HC) separations. Zeolites are commonly used by the chemical and petroleum industries as catalysts and ion-exchangers. They have high potential for separations owing to their unique pore structures and adsorption properties and their thermal, mechanical and chemical properties. Because of zeolites separation properties, low cost, and robustness in industrial process, they are natural choice for use as industrial adsorbents. This is a multidisciplinary effort to research, design, develop, engineer, and test new and improved materials for the separation of branched vs. linear organic molecules found in commercially important HC streams via adsorption based separations. The focus of this project was the surface and framework modification of the commercially available zeolites , while tuning the adsorption properties and the selectivities of the bulk and membrane separations. In particular, we are interested with our partners at Goodyear Chemical, on how to apply the modified zeolites to feedstock isoprene purification. For the characterization and the property measurements of the new and improved materials powder X-ray diffraction (PXRD), Residual Gas Analyzer-Mass Spectroscopy (RGA-MS), Electron Microscopy (SEM/EDAX), temperature programmed desorption (TPD) and surface area techniques were utilized. In-situ carbonization of MFI zeolite membranes allowed for the maximum separation of isoprene from n-pentane, with a 4.1% enrichment of the binary stream with n-pentane. In four component streams, a modified MFI membrane had high selectivities for n-pentane and 1-3-pentadiene over isoprene but virtually no separation for the 2-methyl-2-butene/isoprene pair.
NTIS
Chemical Engineering; Hydrocarbons; Zeolites

20070024986 Oak Ridge National Lab., TN USA, Forest Service, Raleigh, NC, USA
Environmental Influence on Wood Chemistry and Density of Populus and Loblolly Pine (April 1, 2002-January 31, 2004)
Tuskan, G. A.; Ozokwelu, D.; Aug. 11, 2006; 18 pp.; In English
Report No.(s): DE2007-899168; No Copyright; Avail.: National Technical Information Service (NTIS)
The objectives of the study are to: (1) determine the degree to which physical and chemical wood properties vary in association with environmental and silvicultural practices in Populus and loblolly pine and (2) develop and verify species-specific empirical models in an effort to create a framework for understanding environmental influences on wood quality.
NTIS
Conifers; Environmental Chemistry; Wood

20070025049 Molecular Research Inst., Mountain View, CA, USA
Ab initio Quantum Chemical Studies of Reactions in Astrophysical Ices. Reactions Involving CH3OH, CO2, CO, HNCO in H2CO/NH3/H2O Ices
Woon, David E.; American Institute of Physics Conference Proceedings; September 2006; Volume 855, pp. 305-314; In English
Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1063/1.2359569
While reactions between closed shell molecules generally involve prohibitive barriers in the gas phase, prior experimental

and theoretical studies have demonstrated that some of these reactions are significantly enhanced when confined within an icy grain mantle and can occur efficiently at temperatures below 100 K with no additional energy processing. The archetypal case is the reaction of formaldehyde (H2CO) and ammonia (NH3) to yield hydroxymethylamine (NH2CH2OH). In the present work we have characterized reactions involving methanol (CH3OH), carbon dioxide (CO2), carbon monoxide (CO), and isocyanic acid (HNCO) in search of other favorable cases. Most of the emphasis is on CH3OH, which was investigated in the two-body reaction with one H2CO and the three-body reaction with two H2CO molecules. The addition of a second H2CO to the product of the reaction between CH3OH and H2CO was also considered as an alternative route to longer polyoxymethylene polymers of the -CH2O- form. The reaction between HNCO and NH3 was studied to determine if it can compete against the barrierless charge transfer process that yields OCN(-) and NH4(+). Finally, the H2CO + NH3 reaction was revisited with additional benchmark calculations that confirm that little or no barrier is present when it occurs in ice.
Author

Ammonia; Astrophysics; Carbon Dioxide; Carbon Monoxide; Formaldehyde; Methyl Alcohol; Water; Chemical Reactions; Quantum Chemistry; Ice

20070025077 Molecular Research Inst., Mountain View, CA, USA

Quantum Chemical Evaluation of the Astrochemical Significance of Reactions between S Atom and Acetylene or Ethylene

Woon, David E.; Journal of Physical Chemical A; May 31, 2007; ISSN 1089-5639; 1 pp.; In English
Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1021/jp0708392

Addition-elimination reactions of S atom in its P-3 ground state with acetylene (C2H2) and ethylene (C2H4) were characterized with both molecular orbital and density functional theory calculations employing correlation consistent basis sets in order to assess the likelihood either reaction might play a general role in astrochemistry or a specific role in the formation of S2 (X (sup 3 SIGMA (sub g) (sup -)) via a mechanism proposed by Saxena and Misra (Mon. Not. R. Astron. Soc. 1995, 272, 89). The acetylene and ethylene reactions proceed through C2H2S ((sup 3)A')) and C2H4S ((sup 3)A')) intermediates, respectively, to yield HCCS ((sup 2)II)) and C2H3S ((sup 2)A')). Substantial barriers were found in the exit channels for every combination of method and basis set considered in this work, which effectively precludes hydrogen elimination pathways for both S + C2H2 and S + C2H4 in the ultracold interstellar medium where only very modest barriers can be surmounted and processes without barriers tend to predominate. However, if one or both intermediates is formed and stabilized efficiently under cometary or dense interstellar cloud conditions, they could serve as temporary reservoirs for S atom and participate in reactions such as S + C2H2S (right arrow) S2 = C2H2 or S + C2H4S (right arrow) S2 + C2H4. For formation and stabilization to be efficient, the reaction must possess a barrier height small enough to be surmountable at low temperatures yet large enough to prevent redissociation to reactants. Barrier heights computed with B3LYP and large basis sets are very low, but more rigorous QCISD(T) and RCCSD(T) results indicate that the barrier heights are closer to 3-4 kcal/mol. The calculations therefore indicate that S + C2H2 or S + C2H4 could contribute to the formation of S2 in comets and may serve as a means to gauge coma temperature. The energetics of the ethylene reaction are more favorable.
Author

Acetylene; Chemical Reactions; Ethylene; Quantum Chemistry; Atoms; Sulfur

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METALS AND METALLIC MATERIALS

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

20070024659 NASA Glenn Research Center, Cleveland, OH, USA

Development and Evaluation of TiAl Sheet Structures for Hypersonic Applications

Draper, S. L.; Krause, D.; Lerch, B.; Locci, I, E.; Doehnert, B.; Nigam, R.; Das, G.; Sickles, P.; Taberig, B.; Reger, N.; Rissbacher, K.; November 2006; 28 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.03.06
Report No.(s): NASA/TM-2006-214467; E-15759; Copyright; Avail.: Other Sources

A cooperative program between the National Aeronautics and Space Administration (NASA), the Austrian Space Agency (ASA), Pratt & Whitney, Engineering Evaluation and Design, and Plansee AG was undertaken to determine the feasibility of achieving significant weight reduction of hypersonic propulsion system structures through the utilization of TiAl. A trade study defined the weight reduction potential of TiAl technologies as 25 to 35 percent compared to the baseline Ni-base superalloy

for a stiffener structure in an inlet, combustor, and nozzle section of a hypersonic scramjet engine (ref. 1). A scramjet engine inlet cowl flap was designed, along with a representative subelement, using design practices unique to TiAl. A subelement was fabricated and tested to assess fabricability and structural performance and validate the design system. The TiAl alloy selected was Plansee's third generation alloy Gamma Met PX (Plansee AG), a high temperature, high strength gamma-TiAl alloy with high Nb content (refs. 2 and 3). Characterization of Gamma Met PX sheet, including tensile, creep, and fatigue testing was performed. Additionally, design-specific coupons were fabricated and tested in order to improve subelement test predictions. Based on the sheet characterization and results of the coupon tests, the subelement failure location and failure load were accurately predicted.
Author
Hypersonics; Fabrication; Metal Sheets; Titanium Aluminides; Mechanical Properties; Heat Resistant Alloys

20070024852 Colorado School of Mines, Golden, CO, USA
Palladium/Copper Alloy Composite Membranes for High Temperature Hydrogen Separation Final Report
Way, J. D.; Thoen, P. M.; May 31, 2006; 13 pp.; In English
Contract(s)/Grant(s): FG26-03NT41792
Report No.(s): DE2007-898816; No Copyright; Avail.: National Technical Information Service (NTIS)
This report summarizes progress made during the a three year University Coal Research grant (DEFG26- 03NT41792) at the Colorado School of Mines. The period of performance was September 1, 2003 through August of 2006. We made excellent progress toward our goal of contributing to the development of high productivity, sulfur tolerant composite metal membranes for hydrogen production and membrane reactors. Composite Pd and Pd alloy metal membranes with thin metal films (1-7 im) were prepared on porous stainless steel and ceramic supports that meet or exceed the DOE 2010 and 2015 pure hydrogen flux targets at differential pressure of only 20 psi. For example, a 2 im pure Pd membrane on a Pall AccuSep substrate achieved an ideal H2/N2 separation factor of over 6000, with a pure hydrogen flux of 210 SCFH/ft2 at only 20 psig feed pressure. Similar performance was achieved with a Pd80Au20 composite membrane on a similar stainless steel substrate. Extrapolating the pure hydrogen flux of this PdAu membrane to the DOE Fossil Energy target conditions of 150 psia feed pressure and 50 psia permeate pressure gives a value of 508 SCFH/ft2, exceeding the 2015 target. At these thicknesses, it is the support cost that will dominate the cost of a large scale module. In a direct comparison of FCC phase PdCu and PdAu alloys on identical supports, we showed that a Pd85Au15 (mass %) alloy membrane is not inhibited by CO, CO2, or steam present in a water-gas shift feed mixture at 400C, has better resistance to sulfur than a Pd94Cu6 membrane, and has over twice the hydrogen permeance.
NTIS
Copper Alloys; High Temperature Gases; Hydrogen; Membranes; Palladium; Palladium Alloys

20070024861 Lawrence Livermore National Lab., Livermore, CA USA
Welding of Vanadium, Tantalum, 304L and 21-6-9 Stainless Steels, and Titanium Alloys at Lawrence Livermore National Laboratory Using a Fiber Delivered 2.2 kW Diode Pumped CW Nd:YAG Laser
Palmer, T. A.; Elmer, J. W.; Pong, R.; Gauthier, M. D.; Jun. 19, 2006; 115 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898504; UCRL-TR-222245; No Copyright; Avail.: National Technical Information Service (NTIS)
This report summarizes the results of a series of laser welds made between 2003 and 2005 at Lawrence Livermore National Laboratory (LLNL). The results are a compilation of several, previously unpublished, internal LLNL reports covering the laser welding of vanadium, tantalum, 304L stainless steel, 21-6-9 (Nitronic 40) steel, and Ti-6Al-4V. All the welds were made using a Rofin Sinar DY-022 diode pumped continuous wave Nd:YAG laser. Welds are made at sharp focus on each material at various power levels and travel speeds in order to provide a baseline characterization of the performance of the laser welder. These power levels are based on measurements of the output power of the laser system, as measured by a power meter placed at the end of the optics train. Based on these measurements, it appears that the system displays a loss of approximately 10% as the beam passes through the fiber optic cable and laser optics. Since the beam is delivered to the fixed laser optics through a fiber optic cable, the effects of fiber diameter are also briefly investigated. Because the system utilizes 1:1 focusing optics, the laser spot size at sharp focus generally corresponds to the diameter of the fiber with which the laser is delivered. Differences in the resulting weld penetration in the different materials system are prevalent, with the welds produced on the Nitronic 40 material displaying the highest depths (> 5 mm) and minimal porosity. A Primes focusing diagnostic has also been installed on this laser system and used to characterize the size and power density distribution of the

beams as a function of both power and focus position. Further work is planned in which this focusing diagnostic will be used to better understand the effects of changes in beam properties on the resulting weld dimensions in these and other materials systems.
NTIS
Continuous Wave Lasers; Diodes; Neodymium Lasers; Stainless Steels; Titanium Alloys; Welding; YAG Lasers

20070024864 Lawrence Livermore National Lab., Livermore, CA USA
Beryllium Manufacturing Processes
Goldberg, A.; Jun. 30, 2006; 87 pp.; In English
Report No.(s): DE2007-897931; UCRL-TR-222539; No Copyright; Avail.: Department of Energy Information Bridge

This report is one of a number of reports that will be combined into a handbook on beryllium. Each report covers a specific topic. To-date, the following reports have been published: (1) Consolidation and Grades of Beryllium; (2) Mechanical Properties of Beryllium and the Factors Affecting these Properties; (3) Corrosion and Corrosion Protection of Beryllium; (4) Joining of Beryllium; (5) Atomic, Crystal, Elastic, Thermal, Nuclear, and other Properties of Beryllium; and (6) Beryllium Coating (Deposition) Processes and the Influence of Processing Parameters on Properties and Microstructure. The conventional method of using ingot-cast material is unsuitable for manufacturing a beryllium product. Beryllium is a highly reactive metal with a high melting point, making it susceptible to react with mold-wall materials forming beryllium compounds (BeO, etc.) that become entrapped in the solidified metal. In addition, the grain size is excessively large, being 50 to 100 (micro)m in diameter, while grain sizes of 15 (micro)m or less are required to meet acceptable strength and ductility requirements. Attempts at refining the as-cast-grain size have been unsuccessful. Because of the large grain size and limited slip systems, the casting will invariably crack during a hot-working step, which is an important step in the microstructural-refining process. The high reactivity of beryllium together with its high viscosity (even with substantial superheat) also makes it an unsuitable candidate for precision casting. In order to overcome these problems, alternative methods have been developed for the manufacturing of beryllium. The vast majority of these methods involve the use of beryllium powders. The powders are consolidated under pressure in vacuum at an elevated temperature to produce vacuum hot-pressed (VHP) blocks and vacuum hot-isostatic-pressed (HIP) forms and billets. The blocks (typically cylindrical), which are produced over a wide range of sizes (up to 183 cm dia. by 61 cm high), may be cut or machined into parts or be thermomechanically processed to develop the desired microstructure, properties, and shapes. Vacuum hot-isostatic pressing and cold-isostatic pressing (CIP) followed by sintering and possibly by a final HIP'ing (CIP/Sinter/HIP) are important in their use for the production of near net-shaped parts. For the same starting powder, a HIP'ed product will have less anisotropy than that obtained for a VHP'ed product. A schematic presentation illustrating the difference between VHP'ing and HIP'ing is shown in Figure I-1. The types of powders and the various beryllium grades produced from the consolidated powders and their ambient-temperature mechanical properties were presented in the consolidation report referred to above. Elevated-temperature properties and the effect of processing variables on mechanical properties are described in the mechanical properties report. Beryllium can also be deposited as coatings as well as freestanding forms. The microstructure, properties, and various methods used that are related to the deposition of beryllium are discussed in the report on beryllium coatings.
NTIS
Beryllium; Corrosion Prevention; Manufacturing; Mechanical Properties

20070024894 Pennsylvania State Univ., University Park, PA, USA
Improved Tubulars for Better Economics in Deep Gas Well Drilling using Microwave Technology
Agrawal, D.; Gigl, P.; Hunt, M.; Dennis, M.; Dec. 30, 2006; 27 pp.; In English
Contract(s)/Grant(s): DE-FC26-02NT41662
Report No.(s): DE2007-898056; No Copyright; Avail.: National Technical Information Service (NTIS)

The main objective of the entire research program has been to improve the rate-of penetration in deep hostile environments by improving the life cycle and performance of coiled-tubing, an important component of a deep well drilling system for oil and gas exploration, by utilizing the latest developments in the microwave materials technology. Based on the results of the Phase I and insurmountable difficulties faced in the extrusion and de-waxing processes, the approach of achieving the goals of the program was slightly changed in the Phase II in which an approach of microwave sintering combined with Cold Isostatic Press (CIP) and joining (by induction or microwave) has been adopted. This process can be developed into a semicontinuous sintering process if the CIP can produce parts fast enough to match the microwave sintering rates. The main objective of the Phase II research program is to demonstrate the potential to economically manufacture microwave processed coiled tubing with improved performance for extended useful life under hostile coiled tubing drilling conditions. After the completion of the Phase II, it is concluded that scale up and sintering of a thin wall common O.D. size tubing that is widely

used in the market is still to be proved and further experimentation and refinement of the sintering process is needed in Phase III. Actual manufacturing capability of microwave sintered, industrial quality, full length tubing will most likely require several million dollars of investment.
NTIS
Drilling; Economics; Microwave Equipment; Natural Gas; Pipes (Tubes); Steels; Wells

20070024911 Lawrence Livermore National Lab., Livermore, CA USA, Fraunhofer-Inst. fuer Kurzzeitdynamik, Weil am Rhein, Germany
Combustion of Shock-Dispersed Flake Aluminum - High-Speed Visualization
Neuwald, P.; Reichenbach, H.; Kuhl, A.; Jun. 21, 2006; 14 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898488; UCRL-CONF-222292; No Copyright; Avail.: National Technical Information Service (NTIS)

Charges of 0.5 g PETN were used to disperse 1 g of flake aluminum in a rectangular test chamber of 4 liter inner volume and inner dimensions of approximately 10 cm x 10 cm x 40 cm. The subsequent combustion of the flake aluminum with the ambient air in the chamber gave rise to a highly luminous flame. The evolution of the luminous region was studied by means of high-speed cinematography. The high-speed camera is responsive to a broad spectral range in the visible and near infra-red. For a number of tests this response range was narrowed down by means of a band-pass filter with a center wavelength of 488 nm and a half-width of 23 nm. The corresponding images were expected to have a stronger temperature dependence than images obtained without the filter, thus providing better capability to highlight hot-spots. Emission in the range of the pass-band of the filter can be due to continuous thermal radiation from hot Al and Al(sub 2)O(sub 3) particles or to molecular band emission from gaseous AlO. A time-resolving spectrometer was improvised to inspect this topic. The results suggest that AlO emission occurs, but that the continuous spectrum is the dominating effect in our experiments.
NTIS
Aluminum; Cameras; Combustion; Flakes; Fuels; High Speed

20070024997 California Dept. of Health Services, Sacramento, CA, USA
Fatality Assessment and Control Evaluation (FACE) Report for California: A Machine Operator's Helper Died When Caught in a Slitting Machine
Nov. 2006; 7 pp.; In English
Report No.(s): PB2007-108688; FACE-06-CA-002; No Copyright; Avail.: CASI: A02, Hardcopy

An 18-year-old Hispanic laborer, working as a machine operators helper, died when he got caught between a steel sheet and a rewind cylinder on a machine called a 'slitter.' The victim turned 18 years old two weeks before the incident occurred but had been working at his position for approximately six months. He was a temporary employee hired from an employment agency whose documents showed he was 22 years old. The victim prepared the sheet steel to be wound on the cylinder and then gave the machine operator the signal to start the machine. The victim was clear of the machine at that time. The machine jammed, and when the operator went to find the cause, he found the victim caught in between the rolled steel sheet on the rewind cylinder. No one witnessed the actual incident.
NTIS
Accident Investigation; Death; Machinery; Occupation

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*.

20070023756 Colorado Univ., Boulder, CO USA
Crosslinkable Bicontinuous Cubic Assemblies via Mixtures of Gemini Amphiphiles and Butyl Rubber
Lu, Xiaoyun; Elliott, Brian J; Gin, Douglas L; Jan 2004; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-02-C-0018
Report No.(s): AD-A465812; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465812

Butyl Rubber has several excellent advantages as a barrier material fabric, but the lack of permeability of air and water

vapor can lead to fatigue and heat stress in the wearer. This briefing presents a method for the creation of a lyotropic liquid crystals (LLC) and butyl rubber thin film for barrier materials based on the bicontinous cubic phase.
DTIC
Butenes; Polymerization; Protective Coatings; Rubber

20070023757 TDA Research, Inc., Wheat Ridge, CO USA
Solvent Processable Conducting Block Copolymers Based on Poly(3,4-ethylenedioxythiophene)
Luebben, Silvia; Sapp, Shawn; Chang, Emily; D'Sa, Raechelle; Elliott, Brian; Ellis, Wallace; Oct 7, 2004; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465813; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465813

This briefing first examines problems in dealing with intrinsically conducting polymers (ICP). It relates TDA's research objectives in the area of ICPs. Concludes with discussion of developed materials.
DTIC
Block Copolymers; Solvents

20070024449 Winstead Sechrest and Minick, P.C., Dallas, TX, USA
Macroscopic Ordered Assembly of Carbon Nanotubes
Richard, Smalley E., Editor; Colbert, Daniel T.; Smith, Kenneth A.; Walters, Deron A.; Casavant, Michael J.; Huffman, Chad B.; Yakobson, Boris I.; Huage, Robert H.; Saini, Rajesh Kumar; Chiang, Wan-Ting; Qin, Xiao Chuan; 4 Aug. 2005; 32 pp.; In English
Contract(s)/Grant(s): NCC9-77; ONR-N00014-99-1-0246
Patent Info.: Filed 16 Jan 2004; US-Patent-Appl-10/759356; US 2005/0169830
Report No.(s): PB2007-102967; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024449

The present invention is directed to the creation of macroscopic materials and objects comprising aligned nanotube segments. The invention entails aligning single-wall carbon nanotube (SWNT) segments that are suspended in a fluid medium and then removing the aligned segments from suspension in a way that macroscopic, ordered assemblies of SWNT are formed. The invention is further directed to controlling the natural proclivity of nanotube segments to self assemble into ordered structures by modifying the environment of the nanotubes and the history of that environment prior to and during the process. The materials and objects are 'macroscopic' in that they are large enough to be seen without the aid of a microscope or of the dimensions of such objects. These macroscopic, ordered SWNT materials and objects have the remarkable physical, electrical, and chemical properties that SWNT exhibit on the microscopic scale because they are comprised of nanotubes, each of which is aligned in the same direction and in contact with its nearest neighbors. An ordered assembly of closest SWNT also serves as a template for growth of more and larger ordered assemblies. An ordered assembly further serves as a foundation for post processing treatments that modify the assembly internally to specifically enhance selected material properties such as shear strength, tensile strength, compressive strength, toughness, electrical conductivity, and thermal conductivity.
Author
Carbon Nanotubes; Walls; Nanotechnology; Shear Strength; Fullerenes

20070024677 Sandia National Labs., Albuquerque, NM, USA
Thermal Conductivity Measurements of SUMMiT Polycrystalline Silicon
Phinney, L. M.; Kuppers, J. D.; Clemens, R. C.; Nov. 01, 2006; 48 pp.; In English
Report No.(s): DE2007-897917; SAND2006-7112; No Copyright; Avail.: National Technical Information Service (NTIS)

A capability for measuring the thermal conductivity of microelectromechanical systems (MEMS) materials using a steady state resistance technique was developed and used to measure the thermal conductivities of SUMMiT(trademark) V layers. Thermal conductivities were measured over two temperature ranges: 100K to 350K and 293K to 575K in order to generate two data sets. The steady state resistance technique uses surface micromachined bridge structures fabricated using the standard SUMMiT fabrication process. Electrical resistance and resistivity data are reported for poly1-poly2 laminate, poly2, poly3, and poly4 polysilicon structural layers in the SUMMiT process from 83K to 575K. Thermal conductivity measurements for these polysilicon layers demonstrate for the first time that the thermal conductivity is a function of the particular SUMMiT layer. Also, the poly2 layer has a different variation in thermal conductivity as the temperature is decreased than the

poly1-poly2 laminate, poly3, and poly4 layers. As the temperature increases above room temperature, the difference in thermal conductivity between the layers decreases.
NTIS
Fabrication; Polycrystals; Silicon; Thermal Conductivity

20070024685
New Advanced Nanoporous Materials for Industrial Heating Applications
Hunt, A. J.; Dec. 30, 2005; 28 pp.; In English
Report No.(s): DE2007-895530; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project was to develop new advanced nanoporous insulating and refractory materials for industrial heating applications based on sol-gel processing, supercritical drying, and advanced processing techniques. Aerogel-based nanoporous ceramics are a new class of materials suitable for industrial heating applications. A new type of low cost nanoporous ceramic based on alumina, chromia, silica was successfully developed in this project. The small size of the pores and low solid content of these materials quenches the gas conduction and minimizes the solid conductivity of these materials. Long term sintering experiments indicate that this material is stable at a temperature 1050 C for years. This material provides better insulation in high temperature furnaces and other industrial applications that will substantially reduce energy loss and enhance equipment life and operation.
NTIS
Ceramics; Heating; Sol-Gel Processes

20070024740 McKinely Law Office, Richland, WA, USA
Method and Apparatus of Coating a Patterned Thin Film on a Sustrate from a Fluid Source with Continuous Feed Capability
Burrows, P. E., Inventor; Napochak, L. S., Inventor; 14 Feb 05; 7 pp.; In English
Contract(s)/Grant(s): DEAC0576RL0830
Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-057 905
Report No.(s): PB2007-105885; No Copyright; Avail.: CASI: A02, Hardcopy

A method and apparatus for forming patterned coatings of thin film, non-polymeric compounds on a substrate. A mixture of the non-polymeric compound and a liquid carrier is pumped into the interior of a heated evaporation box having an internal temperature sufficient to convert substantially all of the non-polymeric compound and liquid carrier to a gaseous form. The non-polymeric compound and liquid carrier are then removed from the evaporation box via exit slit in the evaporation box. Adjacent to the exit slit, and maintained in a vacuum, is a first substrate upon which the non-polymeric compound condenses. The first substrate is in motion, for example on a web roller, thereby allowing a continuous coating of the non-polymeric compound to be applied to the first substrate. Once the non-polymeric compound is applied to one side of the first substrate, an energy source is then directed toward the opposite side of the first substrate. In this manner, a portion of the non-polymeric compound is removed from the first substrate. A second substrate is then provided adjacent to the first substrate, and the non-polymeric compound is thereby transferred from the first substrate onto the second substrate. By repeatedly transferring portions of the non-polymeric material from the first substrate to the second substrate in this manner, the thin film, non-polymeric materials can be formed onto the second substrate in a predetermined pattern, and in a continuous and highly efficient process.
NTIS
Coating; Substrates; Thin Films

20070024938 Argonne National Lab., IL, USA
Hydrogen Separation Membranes Annual Report For FY 2006
Balachandran, U.; Jan. 31, 2007; 53 pp.; In English
Contract(s)/Grant(s): DE-AC-02-06CH11357
Report No.(s): DE2007-899332; ANL-07/08; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this work is to develop dense ceramic membranes for separating hydrogen from other gaseous components in a nongalvanic mode, i.e., without using an external power supply or electrical circuitry.
NTIS
Ceramics; Hydrogen; Membranes

20070024945 Sandia National Labs., Albuquerque, NM USA

Tunable Ionic-Conductivity of Collapsed Sandia Octahedral Molecular Sieves (SOMS)

Pless, J. D.; Garino, T.; Axness, M.; Nenoff, T. M.; Nov. 2006; 14 pp.; In English

Report No.(s): DE2007-899364; SAND2006-7116; No Copyright; Avail.: National Technical Information Service (NTIS)

This proposal focuses on the synthesis and characterization of tunable perovskite ceramics with resulting controlled strength and temperature of dielectric constants and/or with ionic conductivity. Traditional methods of synthesis involve high temperature oxide mixing and baking. We developed a new methodology of synthesis involving the (1) low temperature hydrothermal synthesis of metastable porous phases with tuned stoichiometry, and element types, and then (2) low temperature heat treatment to build exact stoichiometry perovksites, with the desired vacancy concentrations. This flexible pathway can lead to compositions and structures not attainable by conventional methods. During the course of this program, a series of Na-Nb perovskites were synthesized by calcining and collapsing microporous Sandia Octahedral Molecular Sieve (SOMS) phases. These materials were studied by various characterization techniques and conductivity measurements to better delineate stability and stoichiometry/bulk conductivity relationships. The conductivity can be altered by changing the concentration and type of the substituting framework cation(s) or by ion exchange of sodium. To date, the Na0.9Mg0.1Nb0.8Ti0.2O3-a shows the best conductivity.

NTIS

Absorbents; Ceramics; Dielectrics; Ion Currents; Perovskites; Thermal Conductivity

20070024974 Sandia National Labs., Albuquerque, NM USA

Modeling Injection Molding of Net-Shape Active Ceramic Components

Rao, R.; Mondy, L.; Noble, D.; Hopkins, M.; Notz, P.; Nov. 2006; 60 pp.; In English

Report No.(s): DE2007-899376; SAND2006-6786; No Copyright; Avail.: National Technical Information Service (NTIS)

To reduce costs and hazardous wastes associated with the production of lead-based active ceramic components, an injection molding process is being investigated to replace the current machining process. Here, lead zirconate titanate (PZT) ceramic particles are suspended in a thermoplastic resin and are injected into a mold and allowed to cool. The part is then bisque fired and sintered to complete the densification process. To help design this new process we use a finite element model to describe the injection molding of the ceramic paste. Flow solutions are obtained using a coupled, finite-element based, Newton-Raphson numerical method based on the GOMA/ARIA suite of Sandia flow solvers. The evolution of the free surface is solved with an advanced level set algorithm. This approach incorporates novel methods for representing surface tension and wetting forces that affect the evolution of the free surface.

NTIS

Ceramics; Injection Molding; Shapes

20070025056 NASA Glenn Research Center, Cleveland, OH, USA

A Review of Tribomaterial Technology for Space Nuclear Power Systems

Stanford, Malcolm K.; July 2007; 22 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.07.03

Report No.(s): NASA/TM-2007-214490; E-15780; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025056

The National Aeronautics and Space Administration (NASA) has recently proposed a nuclear closed-cycle electric power conversion system for generation of 100-kW of electrical power for space exploration missions. A critical issue is the tribological performance of sliding components within the power conversion unit that will be exposed to neutron radiation. This paper presents a review of the main considerations that have been made in the selection of solid lubricants for similar applications in the past as well as a recommendations for continuing development of the technology.

Author

Spacecraft Power Supplies; Tribology; Technology Utilization; Nuclear Electric Power Generation; Solid Lubricants

20070025073 NASA Langley Research Center, Hampton, VA USA

Space Environmentally Durable Polymides and Copolyimides

Connell, John W., Editor; Smith, John G., Jr., Editor; Hergenrother, PaulM., Editor; Watson, Kent A., Editor; Thompson, Craig M., Editor; 23 Jun. 2005; 79 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 8 Nov. 2004; US-Patent-Appl-10/988407; US 2005/0137383
Report No.(s): PB2007-103145; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025073

Polyimides displaying low color in thin films, atomic oxygen resistance, vacuum ultraviolet radiation resistance, solubility in organic solvents in the imide form, high glass transition (T.sub.g) temperatures, and high thermal stability are provided. The poly(amide acid)s, copoly(amide acid)s, polyimides and copolyimides are prepared by the reaction of stoichiometric ratios of an aromatic dianhydride with diamines which contain phenylphosphine oxide groups in polar aprotic solvents. Controlled molecular weight oligomeric (amide acid)s and imides can be prepared by offsetting the stoichiometry according to the Carothers equation using excess diamine and endcapping with aromatic anhydrides The polyimide materials can be processed into various material forms such as thin films, fibers, foams, threads, adhesive film, coatings, dry powders, and fiber coated prepreg, and uses include thin film membranes on antennas, second-surface mirrors, thermal optical coatings, and multi-layer thermal insulation (MLI) blanket materials.
Author
Durability; Polyimides; Thin Films; Spacecraft Construction Materials; Aerospace Environments

20070025075 Black Lowe and Graham, PLLC, Seattle, WA, USA
Multifunctional Cryo-Insulation Apparatus and Methods
Eichinger, Jeffrey D., Inventor; Weiser, Erik S., Inventor; Slenk, Joel E., Inventor; Pater, Ruth H., Inventor; 23 Jun. 2005; 13 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS8-01099
Patent Info.: Filed 25 Aug. 2004; US-Patent-Appl-10/926569; US 2005/0136239
Report No.(s): PB2007-103117; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025075

Apparatus and methods for multi-layer foam structures are disclosed. In one embodiment, a method includes filling a first portion of a receptacle with a removable filler. A second portion of the receptacle is filled with a first foam forming a first foam layer. The removeable filler is removed, and at least part of the first portion of the receptacle is filled with a second foam, forming a second foam layer. The first foam may include a polyimide foam, and the second foam may include a polyurethane foam. Other aspects of the invention include a skin attached to the receptacle and the first foam. In other embodiments, hexagonal honeycomb matrix may be used as a receptacle for the first foam and the second foam.
Author
Cryogenics; Insulation; Propellant Tanks; Foams

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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*.

20070023789 Military Academy, West Point, NY USA
An Environment for Comparing Command and Control Architectures
James, John; Maymi, Fernando; Apr 2, 2004; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465946; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465946

As the Services move to transform joint and coalition operations, a new capability being contemplated for the transformed forces is synchronizing manned-combat-vehicle and unmanned-combat-vehicle target engagements. However, we are just beginning to work out the details for implementing such a symphony of coordinated human and machine decisions and actions. One challenge in realizing an implementation is the selection of command and control architectural components and their relationships that will provide the precision and flexibility needed for joint and coalition warfare. We describe an experiment in building an environment for comparing command and control architectures. The experiment involves extending the One Semi-Automated Forces (OneSAF) simulation environment to support analysis of alternative architectures for integration of control of autonomous combat vehicles with control of manned combat vehicles. The autonomous combat

vehicle being simulated is the Loitering Attack Missile (LAM) which is being considered as a supporting indirect fire weapon for the Future Combat System (FCS).
DTIC
Combat; Command and Control; Military Operations

20070023903 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
CFDP Performance over Weather-Dependent Ka-Band Channel
U, Sung I.; Gao, Jay L.; June 19, 2006; 21 pp.; In English; SpaceOps 2006: 9th International Conference on Space Operations, 19-23 June 2006, Rome, Italy; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40124

This study presents an analysis of the delay performance of the CCSDS File Delivery Protocol (CFDP) over weather-dependent Ka-band channel. The Ka-band channel condition is determined by the strength of the atmospheric noise temperature, which is weather dependent. Noise temperature data collected from the Deep Space Network (DSN) Madrid site is used to characterize the correlations between good and bad channel states in a two-state Markov model. Specifically, the probability distribution of file delivery latency using the CFDP deferred Negative Acknowledgement (NAK) mode is derived and quantified. Deep space communication scenarios with different file sizes and bit error rates (BERs) are studied and compared. Furthermore, we also examine the sensitivity of our analysis with respect to different data sampling methods. Our analysis shows that while the weather-dependent channel only results in fairly small increases in the average number of CFDP retransmissions required, the maximum number of transmissions required to complete 99 percentile, on the other hand, is significantly larger for the weather-dependent channel due to the significant correlation of poor weather states.
Author
Protocol (Computers); Weather; Extremely High Frequencies; Channels (Data Transmission); Performance Prediction; Mathematical Models; Communication Networks

20070023936 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Rheology of the Ronne Ice Shelf, Antarctica, Inferred from Satellite Radar Interferometry Data using an Inverse Control Method
Larour, E.; Rignot, E.; Joughin, I.; Aubry, D.; Geophysical Research Letters; March 8, 2005; Volume 32, L05503; 4 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40085; http://dx.doi.org/10.1029/2004GL021693

The Antarctic Ice Sheet is surrounded by large floating ice shelves that spread under their own weight into the ocean. Ice shelf rigidity depends on ice temperature and fabrics, and is influenced by ice flow and the delicate balance between bottom and surface accumulation. Here, we use an inverse control method to infer the rigidity of the Ronne Ice Shelf that best matches observations of ice velocity from satellite radar interferometry. Ice rigidity, or flow law parameter B, is shown to vary between 300 and 900 kPa a(sup 1/3). Ice is softer along the side margins due to frictional heating, and harder along the outflow of large glaciers, which advect cold continental ice. Melting at the bottom surface of the ice shelf increases its rigidity, while freezing decreases it. Accurate numerical modelling of ice shelf flow must account for this spatial variability in mechanical characteristics.
Author
Antarctic Regions; Interferometry; Land Ice; Rheology; Mathematical Models; Satellite-Borne Radar

20070024752 National Telecommunications and Information Administration, Washington, DC USA
Analysis of Electromagnetic Compatibility Between Radar Stations and 4 GHz Fixed-Satellite Earth Stations
Sanders, F. H.; Hinkle, R. L.; Ramsey, B. J.; Jul. 1994; 69 pp.; In English
Report No.(s): PB2007-108530; NTIA-94-313; No Copyright; Avail.: National Technical Information Service (NTIS)

The susceptibility of 3700- to 4200-MHz fixed-satellite service earth stations to interference from radar signals, and the mechanisms by which such interference can occur, are examined. It is shown that interference can occur even if all currently applicable NTIA and FCC spectrum engineering requirements for radar emissions and earth station receiver systems are satisfied. It is further shown that while most interference problems can be resolved by installing appropriate radio frequency (RF) filtering on either the radar transmitter RF output or the earth station RF input, determination of the system that requires filtering depends critically upon the interference coupling mechanism. Methods for determining the interference coupling mechanism are presented.
NTIS
Electromagnetic Compatibility; Ground Stations; Receivers; Television Systems

20070024753 Westat, Inc., Rockville, MD, USA
Collected Case Study Evaluations: Summary of Findings
Sep. 1999; 37 pp.; In English
Report No.(s): PB2007-108517; No Copyright; Avail.: CASI: A03, Hardcopy

The following report is being issued as part of TIIAPs ongoing evaluation initiatives designed to gain knowledge about the effects and lessons of TIIAP funded projects. This report is a summary of findings across case studies of 12 TIIAP projects. The case studies were designed to examine three topics: (1) issues particular to rural communities (2) issues particular to urban communities, and (3) challenges in sustaining information technology-based projects. This report addresses trends uncovered across the urban and rural sites and steps taken by projects to develop sustainable technology initiatives. The appendices provide a description of the process used to select the case study sites and contain a list of the interview topics. The case studies, conducted under contract by Westat, an independent research firm, consisted of extensive review of project files and records, interviews with project staff, representatives of partner organizations, and project end users.
NTIS
Communication Networks; Telecommunication; Information Systems

20070024754 Brown Univ., Providence, RI, USA
State and Federal E-Government in the USA, 2006
West, D. M.; Aug. 2006; 21 pp.; In English
Report No.(s): PB2007-108515; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents the seventh annual update on the features that are available online through American state and federal government websites. Using a detailed analysis of 1,564 state and federal government sites, we measure what is online, what variations exist across the country, and what differences appear between state and national government. We compare the 2006 results to 2000, 2001, 2002, 2003, 2004, and 2005.
NTIS
Information Systems; United States; Governments; Electronic Commerce

20070024755 Office of Management and Budget, Washington, DC USA
Commercial Spectrum Enhancement Act: Report to Congress on Agency Plans for Spectrum Relocation Funds
Feb. 16, 2007; 41 pp.; In English
Report No.(s): PB2007-108514; No Copyright; Avail.: CASI: A03, Hardcopy

On December 23, 2004, President Bush signed into law the Commercial Spectrum Enhancement Act (CSEA, Title II of P.L. 108-494) that created the Spectrum Relocation Fund (SRF) to provide a centralized and streamlined funding mechanism through which Federal agencies can recover the costs associated with relocating their radio communications systems from certain spectrum bands, which were authorized to be auctioned for commercial purposes. The CSEA appropriated such sums as are required for relocation costs, which are financed by auction proceeds. On September 18, 2006, the Federal Communications Commission (FCC) concluded an auction of licenses for Advanced Wireless Services (AWS), on radio spectrum in the 1710 megahertz (MHz) to 1755 MHz band that is currently used by Federal agencies, which was paired with the 2110 MHz to 2155 MHz band in the auction. The 1710 MHz to 1755 MHz band of spectrum was reallocated to AWS under the provisions of the CSEA, including the use of the SRF to facilitate relocation of Federal communications systems, while the 2110 MHz to 2155 MHz band was reallocated to AWS by the FCC and does not require relocation of Federal systems. The AWS auction raised $13.7 billion in net winning bids, and will facilitate the provision of innovative new wireless services to the commercial market.
NTIS
Augmentation; Congressional Reports; Radio Communication; Relocation; Spectra; Telecommunication

20070024756 Westat, Inc., Rockville, MD, USA
Surveying R and D Professionals by Web and Mail: An Experiment
Kerwin, J.; Brick, P. D.; Levin, K.; O'Brien, J.; Cantor, D.; Dec. 2006; 19 pp.; In English
Contract(s)/Grant(s): NIST-SB1341-04-A-00097201.6
Report No.(s): PB2007-108513; No Copyright; Avail.: CASI: A03, Hardcopy

Westat and the Advanced Technology Program conducted an experiment comparing three data collection modes embedded within a survey of organizations conducting research and development (R&D) activities (i.e., the Survey of ATP Applicants 2002). The mode conditions included web, mail, and web with mail follow-up. Follow-up of nonrespondents by

telephone was conducted across each condition of the experiment. Outcomes discussed include response rates before and after telephone follow-up, item nonresponse, response distributions, and length of answers to open-ended questions. Findings indicate that the web mode appeared equal or superior to a comparable mail mode on these measures. We found no advantage for the use of a mail follow-up to the web survey.
NTIS
Data Acquisition; Internets; Surveys; World Wide Web

20070024757 National Telecommunications and Information Administration, Washington, DC USA
Evaluation of Marine VHF Radios: Compliance to IEC (International Electrotechnical) Receiver Standards
Sole, R. L.; Bedford, B.; Oct. 1999; 17 pp.; In English
Report No.(s): PB2007-108504; NTIA-99-363; No Copyright; Avail.: CASI: A03, Hardcopy

The results of these tests show that the Coast Guard and RTCM should consider the following items when developing a marine VHF radio receiver standard based on the IEC standard: the IEC 1097-7 test procedures and performance objectives do not adequately take into account the severe intermodulation and blocking interference that is occurring in major US ports and waterways such as Savannah and New Orleans, the receiver standards should be based on the power levels of the unwanted signals that have been measured in Savannah and New Orleans, and the intermodulation rejection ratio test should be referenced from a specific wanted signal power level and a minimum SINAD, rather than a receivers maximum usable sensitivity for a 20 dB SINAD.
NTIS
High Frequencies; Radio Equipment; Radio Receivers; Receivers; Very High Frequencies; Standards

20070024760 National Telecommunications and Information Administration, Washington, DC USA
Interference Protection Criteria, Phase 1, Compilation from Existing Sources
Paul, A.; Hurt, G.; Sullivan, T.; Patrick, G.; Sole, R.; Oct. 2005; 143 pp.; In English
Report No.(s): PB2007-108501; NTIA-05-432; No Copyright; Avail.: CASI: A07, Hardcopy

The National Telecommunications and Information Administration (NTIA) launched this two-phase study of interference protection criteria (IPC) in order to compile, explain and validate, modify or supplement the levels of protection from interference that are generally expected and provided for various radiocommunication systems. The study is an integral part of President Bushs Spectrum Policy Initiative that was established in May 2003 to promote the development and implementation of a USA spectrum policy for the 21st century. The Secretary of Commerce then established a Federal Government Spectrum Task Force and initiated a series of public meetings to address improvements in policies affecting spectrum use by the Federal Government, State, and local governments, and the private sector. The recommendations resulting from these activities were included in a two-part series of reports released by the Secretary of Commerce in June 2004, under the title Spectrum Policy for the 21st Century - The Presidents Spectrum Policy Initiative. Based on the recommendations contained in these Reports, the President directed the federal agencies on November 30, 2004, to plan the implementation of the 24 recommendations contained in the Reports.
NTIS
Protection; Electromagnetic Interference; Radio Communication

20070024835 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Establishing Wireless Robust Security Networks: A Guide to IEEE 802.11i. Recommendations of the National Institute of Standards and Technology. Computer Security
Frankel, S.; Eydt, B.; Owens, L.; Scarfone, K.; Feb. 2007; 162 pp.; In English
Report No.(s): PB2007-108535; NIST/SP-800-97; No Copyright; Avail.: National Technical Information Service (NTIS)

This guide presents extensive guidance on IEEE 802.11 RSN planning and implementation. It describes a life cycle model for WLANs and presents best practice recommendations related to WLAN security for each phase in the life cycle. WLAN security considerations for each phase include the following: Phase 1: Initiation. This phase includes the tasks that an organization should perform before it starts to design its WLAN solution. These include developing a WLAN use policy, performing a WLAN risk assessment, and specifying business and functional requirements for the solution, such as mandating RSNAs for all WLAN connections. Phase 2: Acquisition/Development.
NTIS
Computer Information Security; Local Area Networks; Wireless Communication; Governments

20070024876 Florida International Univ., Miami, FL, USA
Travel Time Estimation Using Cell Phones (TTECP) for Highways and Roadways
Wunnava, S.; Yen, K.; Babij, T.; Zavaleta, R.; Romero, R.; Jan. 29, 2007; 81 pp.; In English
Contract(s)/Grant(s): BD015-12
Report No.(s): PB2007-108753; No Copyright; Avail.: National Technical Information Service (NTIS)

Across the USA, there has been interest among the State DOTs to investigate alternative technologies to estimate travel time such as the use of cell phones as travel probes. The project was initiated by the Florida Department of Transportation (FDOT) at Florida International University (FIU) in September 2004. The report summaries the studies and investigations regarding the maturity of cell phone technologies for application as real-time traffic probes for travel time estimations along the highways and roadways. Also, the reliability, accuracy, and reproducibility of the travel speed and travel time computations based upon the cell phones as travel probes have been investigated and compared with other methods such as the 511-based operations and global Positioning System (GPS) - based measurements.
NTIS
Air Traffic Control; Highways; Transportation; Wireless Communication

20070024887 Government Accountability Office, Washington, DC, USA
Information Technology: Numerous Federal Networks Used to Support Homeland Security Need to Be Better Coordinated with Key State and Local Information-Sharing Initiatives
Apr. 2007; 81 pp.; In English
Report No.(s): PB2007-108724; GAO-07-455; No Copyright; Avail.: CASI: A05, Hardcopy

A key challenge in securing our homeland is ensuring that critical information collected by the Department of Homeland Security (DHS) and the Department of Justice (DOJ) is shared in a timely manner with federal, state, and local governments and the private sector. It is important that federal networks and associated systems, applications, and data facilitate this vital information sharing. GAO was asked to (1) identify DHS and DOJ networks and Internet-based system applications that support homeland security and (2) determine whether DHS efforts associated with its Homeland Security Information Network are being coordinated with key state and local information-sharing initiatives. GAO assessed the coordination between DHS and two key state and local initiatives of the Regional Information Sharing System program.
NTIS
Computer Networks; Information Systems; Computer Information Security; Governments

20070024899 Swedish Defence Research Establishment, Linkoeping, Sweden
Decision Processes for Command and Control. Rational, Rapid and Negotiated Decisions and Management of Tasks
Wikberg, P.; May 2005; 90 pp.; In Swedish
Report No.(s): PB2007-105541; FOI-R-1644-SE; No Copyright; Avail.: CASI: A05, Hardcopy

The purpose of this study was to concretize how a network based decision process might be manifested in 2020. Four theories on decision making deriving from the behavioral sciences and two from organizational theory were compiled into one decision model. The model describes the choice of method for decision making among three different alternatives to generate commanders intent: rational, rapid and negotiated decisions. The model also describes the management of progressing tasks. The final implementation of the decision is regarded as an administrative task. The model also specifies the necessity to organize a temporary command and control function if the task calls for the coordination of different reciprocally independent organizations. Using the model as a script, two war gaming sessions were conducted. The consequences on technical decision support systems, decision-making methods and organizational solutions were discussed in the context of two different scenarios. Further developments of formalized decision methods are judged to be an important issue. Focus of such a development should be adaptation to international operations.
NTIS
Command and Control; Decision Making; Management Planning; Communication Networks

20070024944 Connecticut Academy of Science and Engineering, Hartford, CT, USA
Information Technology Systems for Use in Incident Management and Work Zones
Fang, C.; Feb. 2006; 76 pp.; In English
Report No.(s): PB2007-108542; Copyright; Avail.: National Technical Information Service (NTIS)

The Connecticut Department of Transportation (ConnDOT), Bureau of Engineering and Highway Operations is responsible for the acquisition, implementation and operation of technologies for use in Incident Management and Work

Zones. The need to cope with incidents affecting the traffic has been recognized for decades. In particular, contending with congestion and incidents in highway work zones has been recognized As one of the priority tasks of most state transportation agencies. The goal of this study was to identify information technology systems that could be utilized in Connecticut to improve operations to facilitate the safe and efficient movement of traffic through and around work zones and incident areas. These technologies have the potential to enhance the safety of motorists and roadway workers, improve the mobility of the traveling public, and fuel conservation. The project's objective was to provide a literature-based best practices review of incident management and work zone information technology systems and to identify potential implementation strategies for Connecticut.

NTIS

Air Traffic Control; Construction; Information Systems; Safety; Systems Management; Technology Utilization; Transportation

20070025027 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Secure Domain Name System (DNS) Deployment Guide: Recommendations of the National Institute of Standards and Technology. Computer Security

Chandramouli, R.; Rose, S.; May 2006; 103 pp.; In English

Report No.(s): PB2007-108493; NIST/SP-800-81; No Copyright; Avail.: CASI: A06, Hardcopy

This document provides deployment guidelines for securing DNS within an enterprise. Because DNS data is meant to be public, preserving the confidentiality of DNS data pertaining to publicly accessible IT resources is not a security objective. The primary security goals for DNS are data integrity and source authentication, which are needed to ensure the authenticity of domain name information and maintain the integrity of domain name information in transit. This document provides extensive guidance on maintaining data integrity and performing source authentication. Availability of DNS services and data is also very important; DNS components are often subjected to denial of service attacks intended to disrupt access to the resources whose domain names are handled by the attacked DNS components. This document presents guidelines for configuring DNS deployments to prevent many denial of service attacks that exploit vulnerabilities in various DNS components.

NTIS

Computer Information Security; Deployment; Direct Numerical Simulation

20070025030 National Telecommunications and Information Administration, Washington, DC USA

Federal Land Mobile Operations in the 162-174 MHz Band in the Washington, D.C. Area. Phase 1. Study of Agency Operations

Aug. 2006; 144 pp.; In English

Report No.(s): PB2007-108533; NTIA-06-440; No Copyright; Avail.: National Technical Information Service (NTIS)

This Phase 1 report contains a description of federal agencies with GMF assignments in the 162-174 MHz band, with emphasis on their LMR systems and their use in the Washington, D.C. area. It also describes many of the mobile radio technologies used by the agencies, and explains the SCAP algorithms used to convert the GMF data to SC maps. The overall objective of this portion of the study was to produce a data set and corresponding analysis as inputs to the Phase 2 work to design possible future federal mobile radio systems. Therefore, this initial report does not contain extensive recommendations or conclusions. This Phase 1 study identifies a wide variety of functions that federal agencies perform in the 162-174 MHz band in the Washington, D.C. area. These functions include law enforcement, transportation, natural resources management, and emergency and disaster relief. There are a total of 4,761 frequency assignments identified from the GMF within 100 miles of Washington, D.C. Of the 4,761 assignments, 2,816 do not have a local infrastructure associated with them (i.e. area-wide assignments). Lacking any specific transmitter location, these 2,816 assignments were excluded from the analysis since the SC model considers only transmitters. In addition, all assignments for receivers (including receive-only sites) were also excluded from the SCAP analysis, as were numerous special-purpose transmitters whose functions would not reasonably be included in a future system. The Phase 1 study considered GMF assignments as of November 2002, which was when this study commenced. Any subsequent modified assignments related to the bureaus or agencies that have been incorporated into the DHS were not addressed, since the DHS was established after the start of this study.

NTIS

District of Columbia; Radio Equipment; Governments; Mobile Communication Systems

20070025044 Research and Technology Organization, Neuilly-sur-Seine, France

Awareness of Emerging Wireless Technologies: Ad-hoc and Personal Area Networks Standards and Emerging Technologies

Stassinopoulos, George, Editor; April 2007; 122 pp.; In English; CD-ROM contains full text document in PDF format

Report No.(s): RTO-TR-IST-035; AC/323(IST-035)TP/32; Copyright; Avail.: CASI: C01, CD-ROM: A06, Hardcopy

The context of the IST-035 Task Group work is centered on a broad categorization of technologies and military application areas, such as: Wireless LAN, Wireless PAN, Ad-hoc Network, Command, Post and Vehicles, Soldier Network, Military Relevance, Interoperability, Urban issues. The present document presents for each technology architecture, security, QoS, performance and frequency aspects. As a reference document it not only discusses technology, but also positions it in the context of the relevant operational deployment. For that reason, the document will be able to take as a starting point the classification of the operational use of COTS systems, made by the SCI-107 WG. This document is structured around 9 chapters, referring to: ad-hoc networks focusing on MANET; an overview of WLAN technologies; broadband wireless access technologies and protocols; a general approach of a Personal Area Network; Command post and urban operation; the soldier network; Security, ECM and ESM issues.

Author

Broadband; Interoperability; Local Area Networks; Wireless Communication; Network Control

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*.

20070023901 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Hot-Electron Bolometer Mixers on Silicon-on-Insulator Substrates for Terahertz Frequencies

Skalare, Anders; Stern, Jeffrey; Bumble, Bruce; Maiwald, Frank; May 2, 2005; 5 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40093

A terahertz Hot-Electron Bolometer (HEB) mixer design using device substrates based on Silicon-On-Insulator (SOI) technology is described. This substrate technology allows very thin chips (6 pm) with almost arbitrary shape to be manufactured, so that they can be tightly fitted into a waveguide structure and operated at very high frequencies with only low risk for power leakages and resonance modes. The NbTiN-based bolometers are contacted by gold beam-leads, while other beamleads are used to hold the chip in place in the waveguide test fixture. The initial tests yielded an equivalent receiver noise temperature of 3460 K double-sideband at a local oscillator frequency of 1.462 THz and an intermediate frequency of 1.4 GHz.

Author

Bolometers; Hot Electrons; SOI (Semiconductors); Substrates; Mixing Circuits; Frequency Measurement

20070023902 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Effect of Integration of Strontium-Bismuth-Tantalate Capacitors onto SOI Wafers

Strauss, Karl F.; Joshi, Vikram; Ohno, Morifumo; Ida, Jiro; Nagatomo, Yoshiki; March 4, 2006; 4 pp.; In English; IEEE Aerospace Conference, 4-11 March 2006, Big Sky, MT, USA; Original contains black and white illustrations

Contract(s)/Grant(s): 1265898; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40094

We report for the first time the successful integration of Strontium-Bismuth-Tantalate ferroelectric capacitors on an SOI Substrate. We have verified that the unique processing requirements of SBT capacitors does not affect the properties of the surrounding FD-SOI transistors, and, conversely, we have verified that the SOI processing does not affect the quality of the SBT capacitors.

Author

Bismuth; Capacitors; Ferroelectricity; Strontium; Wafers; Tantalum Compounds; SOI (Semiconductors)

20070024440 Muniz Engineering, Inc., Houston, TX, USA

SEU and Test Considerations for FPGA Devices

Berg, Malanie; [2006]; 24 pp.; In English; Radiation and Its Effects on Components and Systems (RADECS) 2006, 27-29 Sep. 2006, Athens, Greece; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation provides an overview of Field Programmable Gate Arrays (FPGAs), what they are, implementations in space missions, and current available technologies. Single Event Upsets (SEUs) and Single Event Transients (SETs) are discussed in relation to their effects on FPGAs. Testing goals, considerations, and data analysis are reviewed.

CASI

Field-Programmable Gate Arrays; Single Event Upsets; Spacecraft Electronic Equipment

20070024693 Womble Carlyle Sandridge and Rice, Atlanta, GA, USA

Metal 8-Hydroxyquinoline-Functionalized Polymers and Related Materials and Methods of Making and Using the Same

Weck, M., Inventor; Meyers, A., Inventor; 6 Feb 04; 52 pp.; In English

Patent Info.: Filed Filed 6 Feb 04; US-Patent-Appl-SN-10-773-980

Report No.(s): PB2007-102609; No Copyright; Avail.: CASI: A04, Hardcopy

This invention relates to the synthesis of Mq.sub.n-containing monomeric compounds, comprising a polymerizable moiety, an Mq.sub.n-moiety, and an optional chemical spacer therebetween, wherein q, in each instance, comprises an 8-hydroxyquinoline residue, M is a metal such as Mg, Zn, Al, Ga, or In, and n is 2 or 3 as the valence of the metal requires. For example, the polymerization of Znq.sub.2- or Alq.sub.3-containing monomers, in the presence or absence of a co-monomer, provided a Znq.sub.2- or Alq.sub.3-containing polymer, which retained the optical properties of Znq.sub.2 or Alq.sub.3 in solution, respectively. The Mq.sub.n-containing polymers may be used in, among other things, the fabrication of light-emitting diodes (LEDs).

NTIS

Aluminum; Polymerization; Fabrication

20070024742 Leinnerg (Gunnar G.), Esq., Rochester, NY, USA

Method to Control Residual Stress in a Film Structure and a System Thereof

Parthum, M. J., Inventor; 18 Feb 05; 13 pp.; In English

Contract(s)/Grant(s): DEFG02402ER63410A100

Patent Info.: Filed Filed 18 Feb 05; US-Patent-Appl-SN-11-061 429

Report No.(s): PB2007-105884; No Copyright; Avail.: CASI: A03, Hardcopy

A method for controlling residual stress in a structure in a MEMS device and a structure thereof includes selecting a total thickness and an overall equivalent stress for the structure. A thickness for each of at least one set of alternating first and second layers is determined to control an internal stress with respect to a neutral axis for each of the at least alternating first and second layers and to form the structure based on the selected total thickness and the selected overall equivalent stress. Each of the at least alternating first and second layers is deposited to the determined thickness for each of the at least alternating first and second layers to form the structure.

NTIS

Control Systems Design; Controllers; Residual Stress; Microelectromechanical Systems

20070024747 Myers, Bigel, Sibley and Sajovec, Raleigh, NY, USA

Transistors Having Buried P-Type Laters Beneath the Source Region and Methods of Fabricating the Same

Sriram, S., Inventor; 1 Jun 05; 23 pp.; In English

Contract(s)/Grant(s): N3999799C3761

Patent Info.: Filed Filed 1 Jun 05; US-Patent-Appl-SN-11-142 551

Report No.(s): PB2007-105876; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention provides a unit cell of a metal-semiconductor field-effect transistor (MESFET). The unit cell of the MESFET includes a source, a drain and a gate. The gate is disposed between the source and the drain and on an n-type conductivity channel layer. A p-type conductivity region is provided beneath the source and has an end that extends towards

the drain. The p-type conductivity region is spaced apart from the n-type conductivity channel region and is electrically coupled to the source.
NTIS
Fabrication; Field Effect Transistors; Transistors; Lasers

20070024749 Blake (WIlliam A.), Jones, Tullar and Cooper, PC, Arlington, VA, USA
Compact SRAMs and Other Multiple Transistor Structures
Kumar, A., Inventor; Tiwari, S., Inventor; 11 Feb 05; 16 pp.; In English
Contract(s)/Grant(s): N6600100C8003
Patent Info.: Filed Filed 11 Feb 05; US-Patent-Appl-SN-11-055 014
Report No.(s): PB2007-105874; No Copyright; Avail.: CASI: A03, Hardcopy

A highly dense form of static random-access memory (SRAM) takes advantage of transistor gates on both sides of silicon and high interconnectivity made possible by the complex form of silicon-on-insulator and three-dimensional integration. This technology allows one to form p-channel and n-channel devices very compactly by taking advantage of placement of gates on both sides, making common contacts and dense interconnections in 3D.
NTIS
Random Access Memory; Transistors; Statics

20070024766 Lawrence Livermore National Lab., Livermore, CA USA
Computer Calculations of Eddy-Current Power Loss in Rotating Titanium Wheels and Rims in Localized Axial Magnetic Fields
Mayhall, D. J.; Stein, W.; Gronberg, J. B.; May 17, 2006; 68 pp.; In English
Report No.(s): DE2007-899424; UCRL-TR-221440; No Copyright; Avail.: National Technical Information Service (NTIS)

We have performed preliminary computer-based, transient, magnetostatic calculations of the eddy-current power loss in rotating titanium-alloy and aluminum wheels and wheel rims in the predominantly axially-directed, steady magnetic fields of two small, solenoidal coils. These calculations have been undertaken to assess the eddy-current power loss in various possible International Linear Collider(ILC) positron target wheels. They have also been done to validate the simulation code module against known results published in the literature. The commercially available software package used in these calculations is the Maxwell 3D, Version 10, Transient Module from the Ansoft Corporation.
NTIS
Eddy Currents; Magnetic Field Configurations; Magnetic Fields; Particle Accelerators; Rims; Rotation; Titanium; Wheels

20070024772 Michigan State Univ., East Lansing, MI, USA
Fiber Optical Micro-detectors for Oxygen Sensing in Power Plants. Quarterly Technical Report for July 1-September 30, 2006
Baker, G. L.; Ghosh, R. N.; Osborn, D. J.; Zhang, P.; Oct. 2006; 22 pp.; In English
Report No.(s): DE2007-899505; No Copyright; Avail.: National Technical Information Service (NTIS)

A reflection mode fiber optic oxygen sensor that can operate at high temperatures for power plant applications is being developed. The sensor is based on the (sup 3)O(sub 2) quenching of the red emission from hexanuclear molybdenum chloride clusters. Our approach towards immobilizing the potassium salt of the molybdenum cluster, K(sub 2)Mo(sub 6)Cl(sub 14), at the far end of an optical fiber is to embed the cluster in a thermally cured sol-gel matrix particle. Due to the improved mechanical properties of this approach high temperature sensor measurements were performed up to 100 degrees C. These are promising results for a high temperature fiber optical oxygen sensor based on molybdenum chloride clusters.
NTIS
Detection; Fiber Optics; Gas Detectors; Optical Measuring Instruments; Oxygen

20070024837 Kenyon and Kenyon, Washington, DC, USA
High Efficiency Organic Photovoltaic Cells Employing Hybridized Mixed-Plannar Heterojunctions
Forrest, S. R., Inventor; Uchida, S., Inventor; Rand, B., Inventor; Xue, J., Inventor; 13 Apr 04; 24 pp.; In English
Patent Info.: Filed Filed 13 Apr 04; US-Patent-Appl-SN-10-822 774
Report No.(s): PB2007-105875; No Copyright; Avail.: CASI: A03, Hardcopy

A device is provided, having a first electrode, a second electrode, and a photoactive region disposed between the first electrode and the second electrode. The photoactive region includes a first organic layer comprising a mixture of an organic

acceptor material and an organic donor material, wherein the first organic layer has a thickness not greater than 0.8 characteristic transport lengths, and a second organic layer in direct contact with the first organic layer, wherein: the second organic layer comprises an unmixed layer of the organic acceptor material or the organic donor material of the first organic layer, and the second organic layer has a thickness not less than about 0.1 optical absorption lengths. Preferably, the first organic layer has a thickness not greater than 0.3 characteristic transport lengths. Preferably, the second organic layer has a thickness of not less than about 0.2 optical absorption lengths. Embodiments of the invention can be capable of power efficiencies of 2 percent or greater, and preferably 5 percent or greater.
NTIS
Heterojunctions; Photovoltaic Cells; Solar Cells

20070024875 Lawrence Livermore National Lab., Livermore, CA USA
Rapidly Reconfigurable All-Optical Universal Logic Gates
Goddard, L. L.; Kallman, J. S.; Bond, T. C.; Jun. 23, 2006; 15 pp.; In English
Report No.(s): DE2007-897934; UCRL-CONF-222365; No Copyright; Avail.: Department of Energy Information Bridge

We present designs and simulations for a highly cascadable, rapidly reconfigurable, all-optical, universal logic gate. We will discuss the gate's expected performance, e.g. speed, fanout, and contrast ratio, as a function of the device layout and biasing conditions. The gate is a three terminal on-chip device that consists of: (1) the input optical port, (2) the gate selection port, and (3) the output optical port. The device can be built monolithically using a standard multiple quantum well graded index separate confinement heterostructure laser configuration. The gate can be rapidly and repeatedly reprogrammed to perform any of the basic digital logic operations by using an appropriate analog electrical or optical signal at the gate selection port. Specifically, the same gate can be selected to execute one of the 2 basic unary operations (NOT or COPY), or one of the 6 binary operations (OR, XOR, AND, NOR, XNOR, or NAND), or one of the many logic operations involving more than two inputs. The speed of the gate for logic operations as well as for reprogramming the function of the gate is primarily limited to the small signal modulation speed of a laser, which can be on the order of tens of GHz. The reprogrammable nature of the universal gate offers maximum flexibility and interchangeability for the end user since the entire application of a photonic integrated circuit built from cascaded universal logic gates can be changed simply by adjusting the gate selection port signals.
NTIS
Confinement; Gates (Circuits); Quantum Wells; Integrated Circuits

20070024880 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Elimination of Potential Electrical Stress During EMC (CS01) Testing
Erickson, Kenneth P.; Whittlesey, Albert C.; Vorperian, Vatche; March 20, 2006; 18 pp.; In English; 2nd International Workshop on Verification and Testing of Space Systems, 20-22 Mar. 2006, Turin, Italy; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40118

This viewgraph presentation reviews possible ways to eliminate electrical stress during Electromagneticic Compatibility (EMC) testing. The presentation reviews tests that have had problems due to electrical stress. On December 5, 1995 Cassini Radar instrument failed a functional test in preparation for EMC conducted susceptibility (CSO 1) testing. The instrument power supply did not turn on as required, and failure occurred prior to injection of CS test stimulus. A investigation of the failure was conducted. A PSPICE simulation of Cassini Radar 30V line using the EMC test setup was performed; the result of the simulation was an oscillation on the 30V input of the power supply. In another case: on December 28, 1999 an oscillation occurred on the input power line of the SlRTF Infrared Array Camera (IRAC) while preparing to perform CSOI testing, Resulted in damage to flight hardware. Subsequent to failure, JPL provided GSFC history and corrective action from Cassini Radar CSOI test failure GSFC implemented the same corrective action as JPL, except that the value of the resistor connected across the isolation transformer primary winding is 2.5 ohms instead of 50 ohms. Three recommendations are made: (1) Make EMC test community aware of the problem and potential solutions by presenting papers at major environmental test conferences (2) Include warnings and safeguards in EMC test requirements and procedures (3) Try to convince EMC test equipment suppliers to design a CSOl test fixture similar to fixture shown in the diagram
CASI
Electromagnetic Compatibility; Failure; Oscillations; Power Lines

20070024895 Kordzik (Kelly K.), Dallas, TX, USA, International Business Machines Corp., Endicott, NY, USA
Interface Circuit for Coupling Between Logic Circuit Domains
Kuang, J. B., Inventor; Ngo, J. C., Inventor; Nowka, K. J., Inventor; 8 Apr 04; 15 pp.; In English
Contract(s)/Grant(s): NBCH30390004
Patent Info.: Filed Filed 8 Apr 04; US-Patent-Appl-SN-10-821 047
Report No.(s): PB2007-105870; No Copyright; Avail.: CASI: A03, Hardcopy

CMOS circuitry is partitioned into first and second logic circuit domains. The first logic circuit domain may be optionally a cuttable domains (C-Domains) where circuitry has power supply gating to reduce leakage power and non-cuttable domains (NC-Domains) where circuitry does not have power supply gating. Each output that couples signals from one logic circuit domain to another logic circuit is interfaced with a C-driver and a S-keeper which automatically assure that the output state is held when circuitry is power-gated put to reduce leakage power. The S-keeper and C-driver have low leakage circuits that maintain signal states and are not used for high speed operation.
NTIS
Circuit Diagrams; Circuits; CMOS; Coupling Circuits; Domains; Logic Circuits

20070024971 Sandia National Labs., Albuquerque, NM USA
Microwave to Millimeter-wave Electrodynamic Response and Applications of Semiconductor Nanostructures: LDRD Project 67025 Final Report
Lee, M.; Shaner, E. A.; Highstrete, C.; Reno, J. L.; Wanke, R. C.; Nov. 2006; 23 pp.; In English
Report No.(s): DE2007-899370; SAND2006-7235; No Copyright; Avail.: National Technical Information Service (NTIS)

LDRD Project 67025 provided support to pursue experiments studying the electrodynamic response and possible applications of various innovative semiconductor based nanostructures from microwave (approximately 1 GHz) up to millimeter- and submillimeter-wave (several hundred GHz) frequencies. Under this project, the nonlinear behavior of plasmons in a high-mobility GaAs-AlGaAs quantum-well field-effect transistor was studied up to 145 GHz using difference frequency mixing techniques. Applications of such a plasmon transistor as a millimeter-wave mixer receiver were investigated. Also, negative refractive-index metamaterials consisting of arrays of splitring resonators were fabricated and their transmission resonance spectra measured from 50 to 2000 GHz. High quality factor resonances with large negative index were observed, and applications as a tunable filter or modulator investigated.
NTIS
Microwaves; Millimeter Waves; Nanostructures (Devices); Semiconductors (Materials)

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20070023747 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Testing Fundamental Properties of Ionic Liquids for Colloid Microthruster Applications
Anderson, John R.; Plett, Gary; Anderson, Mark; Ziemer, John; July 9, 2006; 12 pp.; In English; 42nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 9-12 Jul. 2006, Sacramento, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40121

NASA's New Millennium Program is scheduled to test a Disturbance Reduction System (DRS) on Space Technology 7 (ST7) as part of the European Space Agency's (ESA's) LISA Pathfinder Mission in late 2009. Colloid Micronewton Thrusters (CMNTs) will be used to counteract forces, mainly solar photon pressure, that could disturb gravitational reference sensors as part of the DRS. The micronewton thrusters use an ionic liquid, a room temperature molten salt, as propellant. The ionic liquid has a number of unusual properties that have a direct impact on thruster design. One of the most important issues is bubble formation before and during operation, especially during rapid pressure transitions from atmospheric to vacuum conditions. Bubbles have been observed in the feed system causing variations in propellant flow rate that can adversely affect thruster control. Bubbles in the feed system can also increase the likelihood that propellant will spray onto surfaces that can eventually lead to shorting high voltage electrodes. Two approaches, reducing the probability of bubble formation and removing bubbles with a new bubble eliminator device in the flow system, were investigated at Busek Co., Inc. and the Jet Propulsion Laboratory (JPL) to determine the effectiveness of both approaches. Results show that bubble formation is mainly

caused by operation at low pressure and volatile contaminants in the propellant coming out of solution. A specification for the maximum tolerable level of contamination has been developed, and procedures for providing system cleanliness have been tested and implemented. The bubble eliminator device has also been tested successfully and has been implemented in recent thruster designs at Busek. This paper focuses on the propellant testing work at JPL, including testing of a breadboard level bubble eliminator device.
Author
Liquids; Aerospace Engineering; Colloidal Propellants; Microthrust; Bubbles; Feed Systems

20070023780 NASA Dryden Flight Research Center, Edwards, CA, USA
Thermal-Mechanical Testing of Hypersonic Vehicle Structures
Hudson, Larry; Stephens, Craig; July 09, 2007; 22 pp.; In English; Workshop on Materials and Structures for Hypersonic Flight, 9-11 July 2007, Santa Barbara, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023780

A viewgraph presentation describing thermal-mechanical tests on the structures of hypersonic vehicles is shown. The topics include: 1) U.S. Laboratories for Hot Structures Testing; 2) NASA Dryden Flight Loads Laboratory; 3) Hot Structures Test Programs; 4) Typical Sequence for Hot Structures Testing; 5) Current Hot Structures Testing; and 6) Concluding Remarks.
CASI
Hypersonic Vehicles; Thermodynamics; High Temperature Tests; Structural Engineering; Fabrication; Mechanical Engineering

20070024769 Lawrence Livermore National Lab., Livermore, CA USA
Richtmyer-Meshkov Instability-Induced Mixing: Initial Conditions Modeling, Three-Dimensional Simulations and Comparisons to Experiment
Latini, M.; Schilling, O.; Don, W. S.; Jan. 10, 2007; 6 pp.; In English
Report No.(s): DE2007-899437; UCRL-CONF-227160; No Copyright; Avail.: National Technical Information Service (NTIS)

Turbulent transport and mixing in the reshocked multi-mode Richtmyer-Meshkov instability is investigated using three-dimensional ninth-order weighted essentially non-oscillatory simulations. A two-mode initial perturbation with superposed random noise is used to model the Mach 1.5 air/SF6 Vetter-Sturtevant (1) experiment. The mass fraction isosurfaces and density cross-sections show the detailed structure before, during, and after reshock. The effects of reshock are quantified using the baroclinic enstrophy production, buoyancy production, and shear production terms. The mixing layer growth agrees well with the experimental growth rate. The post-reshock growth is in good agreement with the Mikaelian reshock model (2).
NTIS
Simulation; Three Dimensional Models; Turbulent Flow

20070024781 NASA Glenn Research Center, Cleveland, OH, USA
Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery
LaGraff, John E.; Ashpis, David E.; Oldfield, Martin L. G.; Gostelow, J. Paul; December 2006; In English; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery, 20-23 Aug. 2006, Blue Mountain Lake, NY, USA; See also 20070024782 - 20070024815; CD-ROM contains PDF files as well as multimedia files supporting the individual conference presentations.
Contract(s)/Grant(s): NNC06GA02G; AFOSR FA-9550-06-1-0174; WBS 561581.02.08.03.02.01
Report No.(s): NASA/CP-2006-214484; E-15776; Copyright; Avail.: CASI: C01, CD-ROM

This CD-ROM contain materials presented at the Minnowbrook V 2006 Workshop on Unsteady Flows in Turbomachinery, held at the Syracuse University Minnowbrook Conference Center, New York, on August 20-23, 2006. The workshop organizers were John E. LaGraff (Syracuse University), Martin L.G. Oldfield (Oxford University), and J. Paul Gostelow (University of Leicester). The workshop followed the theme, venue, and informal format of four earlier workshops: Minnowbrook I (1993), Minnowbrook II (1997), Minnowbrook III (2000), and Minnowbrook IV (2003). The workshop was focused on physical understanding of unsteady flows in turbomachinery, with the specific goal of contributing to engineering application of improving design codes for turbomachinery. The workshop participants included academic researchers from the

USA and abroad and representatives from the gas-turbine industry and U.S. Government laboratories. The physical mechanisms discussed were related to unsteady wakes, active flow control, turbulence, bypass and natural transition, separation bubbles and turbulent spots, modeling of turbulence and transition, heat transfer and cooling, surface roughness, unsteady CFD, and DNS. This CD-ROM contains copies of the viewgraphs presented, organized according to the workshop sessions. Full-color viewgraphs and animations are included. The workshop summary and the plenary discussion transcripts clearly highlight the need for continued vigorous research in the technologically important area of unsteady flows in turbomachines.
Author
Turbomachinery; Unsteady Flow; Turbine Engines; Wakes; Cascade Flow; Applications Programs (Computers); Turbulence Models

20070024782 Johns Hopkins Univ., Baltimore, MD, USA
Complex Wake-Blade and Wake-Wake Interactions in Multistage Turbomachines
Chow, Yi Chih; Soranna, Francesco; Uzol, Oguz; Katz, Joseph; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The flow structure and spatial distribution of turbulence around a rotor blade within a multistage axial turbomachines are inherently affected by interaction with wakes shed by upstream blades. Several associated phenomena have been investigated experimentally by performing PIV measurements in a facility that has blades and fluid with matched refractive indices. This setup enables unobstructed view of the entire flow field including boundary layers, wakes, hub and tip vortices. The presentation provides a few striking examples of the complex turbulence and flow structure generated by wake-blade and wake-wake interactions, such as: 1) Modifications to the turbulence within an IGV wake impinging on a blade due to exposure to the strain field generated by this blade, including effects of rapid straining, compression, wall blockage and highly inhomogeneous turbulence production; 2) Periodic changes to the velocity profile and scales of the blade boundary layer, which are caused by wake impingement. Analysis demonstrates that the unsteady pressure field generated due to the wake passage stabilizes the boundary layer near the trailing edge of the rotor blade; 3) Shearing of the rotor wake by the non-uniform flow field generated by upstream IGV blades causes inhomogeneous turbulence production and formation of turbulent hot spots. The spatial distribution of turbulence differs substantially from that observed in prior studies of curved wakes. Specific causes and mechanisms are identified; and 4) Modifications to the flow structure and turbulence near the tip of one blade due to impingement of a tip vortex generated by another blade in the same rotor.
Author
Flow Distribution; Rotor Blades (Turbomachinery); Turbomachinery; Turbulence; Vortices; Turbulent Wakes; Blade-Vortex Interaction

20070024783 Case Western Reserve Univ., Cleveland, OH, USA
Transient Disturbances Generated by Quasi-Random Surface Roughness
White, Edward B.; Downs, Robert S., III; Denissen, Nicholas A.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781
Contract(s)/Grant(s): FA9550-01-1-0048; Copyright; Available from CASI only as part of the entire parent document

Recent experiments by White and coworkers at Case Western Reserve University (Case) and by Fransson and coworkers at the Royal Institute of Technology (KTH) in Stockholm have established that spanwise-periodic arrays of three-dimensional (3D) surface roughness elements excite steady boundary layer disturbances that undergo a transient period of algebraic energy growth followed by exponential decay. The flow downstream of the periodic roughness elements is composed of steady high- and low-speed streamwise streaks. The Case and KTH experiments used spanwise roughness arrays to produce a disturbance field with a precisely controllable set of spanwise wavenumbers and a very clear disturbance origin. However, the ultimate interest of the ongoing work on roughness-induced transient disturbances is to provide information about behavior in more-realistic situations including disturbance behavior over fields of random roughness. In order to study this phenomenon in a well-controlled way that is suitable for comparison with numerical simulations, a technique has been developed to generate random roughness fields and to manufacture these fields using rapid prototyping technology.
Derived from text
Surface Roughness; Surges; Rapid Prototyping; Free Flow; Flow Distortion

20070024784 Imperial Coll. of Science and Technology, London, UK

DNS of Transition in a Linear Compressor Cascade

Zaki, Tamer A.; Durbin, Paul A.; Wissink, Jan; Rodi, John; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A Direct Numerical Simulation (DNS) of flow over a compressor blade with incoming free-stream turbulence was performed. The geometry corresponds to an experimental configuration. The surface pressure distribution is in good agreement with lab data. This gives some confidence that the configuration is realistic. Due to the incident turbulence, with Tu = 2.5% at the leading edge plane and the moderate Reynolds number, (Re = 1:4 10(exp 5)), transition to turbulence occurs on both sides of the airfoil. The adverse gradient on the pressure side promotes transition. The favorable gradient on the suction side delays it, but deceleration toward the rear produces a large-scale instability and rapid transition. The simulation required approximately 84 x 10(exp 6) grid points. The pressure surface boundary layer undergoes by-pass transition in a manner similar to a at-plate boundary layer subject to free-stream turbulence: the incident vortical disturbances trigger the formation of elongated boundary layer perturbation jets (or streaks) with amplitudes on the order of 10% of the mean flow. The inception of turbulent spots, which leads to breakdown, is triggered on the backward perturbation jets (negative u- fluctuations). The turbulent patches, easily identified in both the wall normal and the spanwise fluctuations, spread and finally merge into the downstream, fully turbulent region. The suction surface boundary layer is initially subject to a FPG, followed by a strong APG. The FPG suppresses the formation of boundary layer streaks. The result is a stabilized boundary layer that does not undergo by-pass transition and remains laminar. Farther downstream, the strong APG causes the laminar boundary layer to separate, which is followed by turbulent reattachment.

Derived from text

Compressor Blades; Compressors; Direct Numerical Simulation; Cascade Flow; Linearity; Computational Grids; Free Flow; Turbulent Flow

20070024785 Brigham Young Univ., Provo, UT, USA

Unsteady Transition and Separation in an LPT Cascade

Bons, Jeffrey; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Boundary layer separation can be a significant detriment to turbine stage performance if the separation bubble does not reattach before the trailing edge of the blade. Laminar to turbulent boundary layer transition plays a critical role in determining separated shear layer development and potential reattachment. Flow control experiments using pulsed vortex generator jets (VGJs), have demonstrated substantial reductions in LPT separation losses. The control mechanism for pulsed VGJs appears to be some combination of unsteady transition and vortical effects. The present study explores some of the differences between unsteady VGJ implementation with reattaching (closed) and non-reattaching (open) separations. Phase-averaged and time-resolved flow measurements were made for both a mid-loaded (L1M) and an aft-loaded (Pack B) LPT blade profile at low Reynolds numbers.

Derived from text

Boundary Layer Separation; Unsteady Flow; Cascade Flow; Low Pressure; Turbine Engines

20070024786 Carleton Univ., Ottawa, Ontario, Canada

Effects of Freestream Turbulence and Streamwise Pressure Gradient on the Substructures of Turbulent Spots

Yaras, Metin I.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Accurate prediction of laminar-to-turbulent transition of boundary layers is critical to the aerodynamic design and analysis of turbomachinery blades that are continually optimized for increased loading. The prediction of the transition process consists of quantifying the streamwise location of transition onset and the streamwise length that is required to reach a fully-turbulent state, with the latter often being dictated by the rates of production, convection and spreading of turbulent spots. It is important to understand the internal structure of turbulent spots, for this relates to the way the spot interacts with the surrounding laminar boundary-layer fluid thus dictating its spreading rate, and also determines the way we should calculate the time-averaged boundary- layer properties in the transition zone. In the current work, experimental results on the internal flow structure of turbulent spots are presented, and the sensitivity of this structure to streamwise acceleration rate and freestream turbulence is

examined. Measurements were performed on a flat plate, with two variations of freestream acceleration rate and three levels of freestream turbulence. The turbulent spots were generated artificially at a fixed distance from the test-surface leading edge, and the development of the spot was documented through hotwire measurements.
Derived from text
Free Flow; Pressure Gradients; Turbulent Flow; Substructures; Wind Tunnel Tests; Laminar Boundary Layer

20070024787 Iowa State Univ., IA, USA
Computational Methods and Transition Group
Durbin, Paul; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

This viewgraph document is a report from the breakout group concerned with Computational Methods and Transition. The report reviews discussion on practical prediction methods, and a critical review of models. The comments were summarized with 'Modelers, computationalists and experimentalists must work in concert.' and 'Experiment, computation and brain-power: experimenters should have access to DNS data to pursue their ideas; data mining should occupy more of our time'
CASI
Direct Numerical Simulation; Computation

20070024788 Ohio State Univ., USA
Heat Transfer and Film Cooling Group
Dunn, Mike; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A viewgraph presentation describing the experimental and analytical processes of heat transfer and film cooling is shown.
CASI
Film Cooling; Heat Transfer; Computational Fluid Dynamics; Low Temperature

20070024789 General Electric Aviation, Cincinnati, OH, USA
Fans and Compressors Group
Bill Solomon; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A discussion on fan blades and compressor design including issues concerning people, management and problems areas are presented.
CASI
Compressors; Fan Blades; Mechanical Engineering; Computational Fluid Dynamics

20070024790 Notre Dame Univ., IN, USA
Flow Control Group
Corke, Tom; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A viewgraph presentation on flow control is shown. The topics include: 1) Components of gas-turbine engines where flow control can have an impact; 2) Prioritize these in terms of impact and feasibility; 3) Fundamental fluid physics associated with engine internal flow control; and 4) Rank impact of fluid physics elements.
CASI
Gas Turbine Engines; Fluid Flow; Flow Regulators; Internal Flow

20070024791 Indian Inst. of Science, Bangalore, India
Workshop Summary Transcript
Narasimha, Roddam; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A summary of the workshop on unsteady flows in turbomachinery is given. The topics discussed include: 1) Unsteady Interactions; 2) CFD Modeling; 3) Heat Loads; 4) Instability; 5) Flow Control and 6) LPT Closure. The author also gives his

thoughts, suggestions and questions related to the presentations that were given on computational fluid dynamics, airfoil design, flutter, oscillating blades and other subjects.
CASI
Turbomachinery; Unsteady Flow; Computational Fluid Dynamics; Heat Transfer

20070024792 Connecticut Univ., Storrs, CT, USA
Comparison of Turbine Cascade Measurements of Skin Friction, Limiting Streamline Direction, and Heat Transfer
Holley, Brian M.; Langston, Lee S.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Surface measurements of skin friction, limiting streamline direction, and heat transfer taken in a large scale plane turbine cascade are presented and compared. The measurements of skin friction and limiting streamline direction are recent additions to a data set for a particular cascade at a particular set of flow conditions. This data set now comprises surface measurements of skin friction, limiting streamline direction, static pressure and heat transfer as well as ten planes of five-hole pneumatic probe flow field measurements upstream, within and downstream of the cascade. Skin friction and limiting streamline direction are obtained using oil film interferometry (OFI). During an experiment, a locally applied very thin oil film is acted upon by skin friction along limiting streamlines. Subsequent interferometric patterns in the oil film are used to determine spatial oil thickness variations, from which skin friction values and limiting streamline direction are inferred. The OFI results quantitatively display flow features such as the endwall saddle point, a pressure side separation bubble on the airfoil, and separation lines on both the endwall and airfoil. Because of dust, attachment lines are only qualitatively displayed. The heat transfer measurements were taken on the same cascade under similar flow conditions during an earlier study. Thermocouple data taken on a surface with constant heat flux provided the heat transfer measurements. These surface measurements are all timeaveraged, and any unsteadiness is integrated into the measurement. Comparison of the experimental results show that locations of high heat transfer cannot be inferred in general from locations of high skin friction.
Derived from text
Cascade Flow; Heat Transfer; Skin Friction; Turbine Blades; Mechanical Engineering; Flow Distribution

20070024793 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Blade Row Interaction Research at the Air Force Research Laboratory Propulsion Directorate
Gorrell, Steven E.; Car, David; Puterbaugh, Steven L.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The Air Force Research Laboratory (AFRL) Compressor Aero Research Lab (CARL) has been conducting experimental and computational research on transonic compressor blade row interactions for some time. As reported, the Stage Matching Investigation (SMI) rig test documented that the axial spacing between an upstream stator and downstream transonic rotor has a significant effect on stage performance. Mass flow rate, pressure ratio, and efficiency all decreased as the axial spacing between the wake generator and transonic rotor was reduced. This additional loss production occurs as a result of interaction between the upstream wake generator and downstream transonic rotor. Time-accurate simulations of the SMI experiment revealed some important aspects of the production of this additional loss. At close spacing the rotor bow shock was chopped by the wake generator trailing edge and formed a pressure wave on the upper surface of the wake generator that propagated upstream until it weakened. The bow shock was oblique as it interacted with the wake generator trailing edge, but the resulting pressure wave that formed was turned more normal to the wake generator blade surface. The resulting moving shock produced an entropy rise. The magnitude of loss production was affected by the strength of the bow shock and how much it turned as it interacted with the trailing edge of the wake generator. At far spacing the rotor bow shock degenerated into a bow wave before it interacted with the stator trailing edge and no significant pressure wave formed on the stator upper surface. For this condition, no additional loss was produced. Details of the unsteady flow environment were analyzed with measurements using Digital Particle Image Velocimetry (DPIV) and with time-accurate simulations using the 3D unsteady Navier-Stokes CFD solver TURBO. Generally there was excellent agreement between the measurements and simulations, instilling confidence in both. At close spacing vortices are shed from the trailing edge of the upstream stationary blade row in response to the unsteady, discontinuous pressure field generated by the downstream rotor bow shock. Shed vortices increase in size and strength and generate more loss as spacing decreases, a consequence of the effective increase in rotor bow shock strength at the stationary blade row trailing edge. A relationship for the change in shed vorticity as a function of rotor bow shock strength was presented that predicts the difference between close and far spacing TURBO simulations.
Derived from text
Compressor Blades; Computational Fluid Dynamics; Shock Waves; Transonic Compressors; Blade-Vortex Interaction; Compressors

20070024794 Royal Inst. of Tech., Sweden

Experimental and Numerical Study of Unsteady Aerodynamics in an Oscillating LPT Cascade

Vogt, Damian M.; Fransson, Torsten H.; Martensson, Hans E.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The unsteady aerodynamics during controlled blade oscillation in an annular sector cascade with low-pressure turbine (LPT) blades has been studied experimentally and numerically. Following an influence coefficient approach a cascade of seven blades has been employed with the middle blade made oscillating in controlled modes. One of the novelties of the presented study is the combination of three-dimensional flow and three-dimensional blade oscillation due to increasing bending amplitude from hub to tip as present for low-order structural modes. On the numerical side a linear Euler flutter prediction tool has been used at different degree of detailing. The influence coefficient technique is used in the experiments to transfer data to the traveling wave mode as well as to analyze the unsteady responses on the individual blades. The results indicate that the inviscid model is capable of capturing the main features of the unsteady aerodynamics during blade oscillation and that it can be used to support design work.

Derived from text

Low Pressure; Turbine Blades; Unsteady Aerodynamics; Cascade Flow; Oscillating Flow; Computational Fluid Dynamics; Mathematical Models

20070024795 United Technologies Corp., East Hartford, CT, USA

The Dynamics of the Horseshoe Vortex and Associated Endwall Heat Transfer

Praisner, Thomas J.; Sabatino, Daniel R.; Smith, Charles R.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

When a turbulent boundary layer approaches a bluff-body obstruction, the body-generated adverse-pressure gradient precipitates a separation process that forces the impinging boundary layer vorticity to reorganize into a horseshoe vortex. The horseshoe vortex circumscribes the leading edge of the bluff body with legs extending downstream, and is characterized by significant aperiodic unsteadiness. In turbomachinery applications, the leg of horseshoe vortex on the pressure side of the airfoil has been shown to have high aerodynamic losses associated with it. RANS-based performance predictions in endwall regions of multi-stage turbines and cascades, where the horseshoe vortex is a dominant flow feature, have been shown to be clearly deficient. Additionally, the leading-edge region of turbulent endwall flows is of interest in turbomachinery applications because the presence of the horseshoe vortex system has been shown to increase local endwall heat transfer rates by as much as 300% above flat plate levels. High heat transfer rates in leading-edge regions of high-pressure turbines are known to cause thermal-mechanical fatigue, spalling of thermal barrier coatings, and airfoil endwall/platform burning. Here we report on instantaneous flow topology and the associated endwall heat transfer in the leading-edge endwall region of a symmetric airfoil. An experimental technique was employed that allowed the simultaneous recording of instantaneous particle image velocimetry flow field and thermochromic liquid-crystal-based endwall heat transfer data. The endwall flow is dominated by the horseshoe vortex while a secondary vortex develops sporadically immediately upstream of the horseshoe vortex. The region upstream of the horseshoe vortex is characterized by a bimodal switching of the near-wall reverse flow, which results in quasi-periodic eruptions of the secondary vortex. The bimodal switching of the reverse flow in the vicinity of the secondary vortex is linked to the temporal behavior of the down-wash fluid on the leading edge of the foil. Frequency analysis of the flow field and endwall heat transfer data, taken together, indicate that the eruptive behavior associated with the horseshoe vortex occurs at a frequency that is essentially the same as the measured turbulence bursting period of the impinging turbulent endwall boundary layer. A typical example of instantaneous symmetry-plane vorticity distributions juxtaposed with the corresponding instantaneous endwall Stanton number distributions is shown. Off the symmetry plane, the horseshoe vortex grows in scale, and ultimately experiences a bursting, or breakdown, upon being subjected to an adverse pressure gradient. The data presented here elucidate the high level of relatively large-scale unsteadiness associated with the horseshoe vortex and the resulting enhancement of endwall heat transfer, phenomena which are intractable with even time-accurate RANS-based simulations. This work underscores the need for more advanced computational work, such as LES and DNS studies, that needs to be directed at predicting and understanding endwall flows.

Author

Bluff Bodies; Horseshoe Vortices; Turbulent Boundary Layer; Turbulent Flow; Wall Flow; Boundary Layer Separation; Separated Flow; Turbulent Heat Transfer; Flow Visualization

20070024796 Pennsylvania State Univ., University Park, PA, USA

Effects of Inlet Flow Conditions on Endwall Flows in Turbine Vane Passages

Thole, Karen A.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Traditionally it has been considered that the secondary flows generated in the endwall region of a turbine vane passage are composed of a horseshoe vortex that develops into a pressure side leg and suction side leg. As these vortices convect along the endwall, the pressure side leg develops into what is known as the passage vortex that is promoted through the crossflow present from the pressure gradient from the pressure to the suction side of the adjacent airfoil. What is assumed, however, in this secondary flow representation is the presence of a canonical boundary layer that is approaching the turbine vane leading edge-endwall juncture. This assumption for a turbine application is not likely to be correct given the complexities of the exiting combustor flows. The flow and thermal fields at the combustor-turbine junction in a gas turbine engine is highly complex and cannot be idealized by a two-dimensional, turbulent boundary layer exiting the combustor. Gas turbine combustors, particularly for aero engine designs, often contain large dilution holes, film-cooling holes along the approaching liner, and some type of leakage juncture at the combustor-turbine interface. This type of combustor design produces non-uniformities near the platform in both the span (radial) and pitch (circumferential) directions with large levels of turbulence in the mainstream. The results that will be presented indicate the importance of quantifying the proper inlet conditions to the turbine, particularly in the near platform region. Flowfield measurements in the passage for a flow condition similar to what would exit a gas turbine combustor indicate a secondary flow pattern different than that of an approaching two-dimensional turbulent boundary layer. Figure 1 shows that while the suction side leg of the horseshoe vortex was much smaller than it is for a turbulent boundary layer, the passage vortex became much stronger for the more representative combustor flow. In addition, a counter-rotating vortex above the passage vortex was identified. Both of these vortices can be explained by the total pressure variation exiting the combustor. Convective heat transfer measurements along the endwall also indicate differences depending upon whether there is an approaching two-dimensional turbulent boundary layer or a more realistic combustor flow. Figure 2 compares measured Stanton number contours on the endwall. As can be seen from these measurements, higher heat transfer coefficients result for the case where there is a leakage slot just upstream of the turbine vane. This leakage flow is a design feature in much combustor-turbine junctures. To mitigate or control the effects of the secondary flows in a turbine vane passage, it is paramount to understand the flow exiting the combustor.

Author

Film Cooling; Inlet Flow; Engine Inlets; Vanes; Combustion Chambers; Gas Turbine Engines; Wall Flow; Flow Distribution

20070024797 Leicester Univ., UK

Final Plenary Session Transcript

Gostelow, Paul; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A final summary from the four ad hoc working groups is discussed. The topics include: 1) Heat Transfer and Film Cooling; 2) Unsteady Flows in Compressors and Fans; 3) Flow Control; and 4) Computational Methods and Transition. A report of the industry panel is also given.

CASI

Computational Fluid Dynamics; Turbomachinery; Engine Design; Unsteady Aerodynamics

20070024798 General Electric Co., Evendale, OH, USA

Unsteady Flow Downstream of a Transonic Rotor

Solomon, W.; Shin, H-W.; Wilkin, D.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A transonic fan model has been run in the NASA 9x15 wind tunnel. Data obtained with a crossed hot-wire technique is presented. Measurements downstream of the fan blade are compared with a steady RANS CFD code. Comparisons are shown at a design speed and at an over-speed condition. Under these conditions, the levels of turbulence predicted and measured in the rotor wake and in the tip flow are significantly higher than commonly used in simplified experimental configurations. The X-wire data suggests that CFD under-predicts the velocity and angle perturbations due to the rotor wake at the measurement plane. Estimation of the vector diagrams indicates that the CFD may be under-predicting deviation off the rotor blade. At the over-speed condition a more significant difference between the predicted and measured radial flow distribution is observed.

Grid refinement and use of a transition model provides a modest improvement to the simulation, but does not explain the significant differences seen at over-speed.
Author
Computational Fluid Dynamics; Unsteady Flow; Rotor Dynamics; Turbomachinery; Wind Tunnel Tests; Transonic Wind Tunnels; Transonic Flow

20070024799 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Unsteady Fluid Dynamics of Turbines: A Perspective on Possible Directions to Improve Future Engine Designs
Abhari, Reza S.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

This keynote presentation discusses unsteady flows in turbomachines, with specific focus on aerodynamic performance, heat transfer and cooling, forced response, and proposals for future directions.
CASI
Fluid Dynamics; Turbomachinery; Unsteady Flow; Turbine Engines

20070024800 Tasmania Univ., Hobart, Australia
Unsteady Wake-Induced Transition on Axial Compressor Blades-Calming and Leading Edge Interaction Effects
Walker, G. J.; Henderson, A. D.; Hughes, J. D.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The beneficial application of calming effects associated with wake-induced turbulent strips on axial turbine blades has led to significant performance improvements for aero-engine low-pressure turbines in recent years. It is not yet clear whether the design of axial compressor blades could be improved by the application of similar design principles. The increased loss in the turbulent strips needed to promote significant regions of calmed flow must be carefully weighed against the potential loss reductions due to calming. However, performance enhancements for compressors are not simply confined to increases in efficiency or blade loading: here improvements in operating stability and stall margin are also of great importance. An accurate prediction of the appearance and development of wake-induced turbulent strips is a necessary prerequisite for any rational application of calming effects in compressor blade design. The strength and periodicity of incident wakes are key aspects of the disturbance field, and the blade geometry and time-mean surface pressure distribution may significantly influence the boundary layer response. Leading edge interactions associated with wake chopping are of vital importance, as the leading edge appears to be the principal receptivity site for disturbances leading to the appearance of wake-induced turbulent strips on axial compressor blade suction surfaces. This presentation commences by reviewing data of Hughes and Henderson concerning the effects of blade loading, axial row spacing, wake-wake interactions and free-stream turbulence on unsteady transitional flow on the outlet stator blades of a 1.5-stage axial compressor.
Derived from text
Axial Flow Turbines; Compressors; Leading Edges; Unsteady Flow; Wakes; Compressor Blades

20070024801 Technische Univ., Berlin, Germany
Response of Separation Bubble to Velocity and Turbulence Wakes
Hourmouziadis, J.; Hofmann, G.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The effects of profile wakes on downstream blade rows have been studied extensively in the past several decades. Such flows consist of a velocity defect and a turbulence wake. Due to their nature these two characteristics have a different influence on the downstream boundary layer. Experiments have been performed in a low speed facility with a superimposed pressure distribution on a flat plate similar to that on the suction surface of a turbine blade generating a typical transitional separation bubble. High resolution hot wire measurements were carried out. The velocity and the turbulence wake were separated into a periodic low turbulence flow and a constant velocity flow with periodic turbulence by means of appropriate experimental setups. Steady flow results have been obtained with varying main flow turbulence levels. Earlier experiments in periodic flow indicated that there is a phase shift between the external flow and the fluctuations of the separated shear layer. It was confirmed that this is due to the transition process which is effected both from periodicity and turbulence. The measurements in steady flow permitted a detailed analysis of the mixing process during transition and reattachment. An evaluation method was developed using the skewness of the velocity signal. It could be shown that mixing takes place in both sides of the separated shear layer, into the dead water zone and into the main flow. Consequently the resulting thickness after reattachment increases

with the thickness of the separation bubble. An assessment of losses from downstream momentum thickness showed a clear correlation which appears to be independent of main flow turbulence and Reynolds number. Main flow turbulence has a considerable effect within the stable laminar boundary layer far upstream of separation and transition, starting practically at the leading edge. The velocity fluctuations near the wall are stronger than those in the main flow. This phenomenon, often observed in unsteady flow with passing wakes, is obviously also present in steady flow with high main flow turbulence. It is similar to DNS simulation results (Jacobs and Durbin 2000) and could have something to do with the receptivity response of the boundary layer.
Author
Bubbles; Separated Flow; Velocity Distribution; Turbulent Wakes; Unsteady Flow

20070024802 National Aerospace Lab., Bangalore, India
Transitions on Swept Leading Edges
Viswanath, P. R.; Mukund, R.; Narasimha, Roddam; Prabhu, A.; Crouch, J. D.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

This presentation covers two experimental investigations inspired by problems in external aerodynamics (specifically swept wings) but relevant, we believe, to situations in internal aerodynamics as well (effects of convex curvature and sweep on leading edge flows).
Derived from text
Leading Edges; Swept Wings; Unsteady Aerodynamics; Turbomachinery; Boundary Layer Transition; Wind Tunnel Tests

20070024803 Notre Dame Univ., IN, USA
Turbine Blade Tip Clearance Flow Control Using Plasma Actuators
Douville, Travis C.; Stephens, Julia; VanNess, Daniel K.; Corke, Thomas C.; Morris, Scott C.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The over-tip leakage flow remains a primary source of energy loss for axial flow turbine blades, limiting the amount of useful work to be extracted by the turbine and thus the efficiency of the turbomachine. Noting the industrial, commercial, and military implications to improved gas turbine engine efficiency and reliability, active and passive flow control techniques have been pursued to minimize loss on the blades. Two linear cascade facilities have been developed at the University of Notre Dame to study the flow field in the tip gap region of turbine blades. Both of the facilities use Pratt & Whitney Pak-B blade shapes to simulate the pressure distribution of a generic low-pressure turbine stage. One facility has 11 blades that are a high aspect ratio of 4.5. The Reynolds numbers based on axial chord for conditions used in this facility range from 10,000 to 100,000. The other facility is designed to examine higher velocities and Reynolds numbers. It consists of three blades (2 passage) that have a low aspect ratio of 0.96. Typical Reynolds numbers range from 100,000 to 500,000, corresponding to Mach numbers of 0.1 to 0.33. In both cases, the center blade in the cascade is cantilevered to provide an unobstructed gap between the blade tip and end wall on the unsupported end. The gap-to-chord ratio of the center blade in the two facilities can be varied from 0 to 5 percent. Blade pressure distributions at midspan and tip of the cantilevered blade are measured with static pressure ports on the surface. Additionally, pressure taps are located on the tunnel wall under the blade tip. A 5-hole Pitot probe carried on a 2-D traverse system is used to study the flow downstream of the blades. This is used to obtain aerodynamic loss coefficients and three dimensional velocity vectors in a matrix of points along the blade edge and across blade wake, with particular focus on the gap region. Examples of the measurements made in the wake of a blade with a 4% g/c ratio at a Reynolds number of 500,000 are shown.
Derived from text
Blade Tips; Gas Turbine Engines; Turbine Blades; Flow Regulators; Actuators; Axial Flow Turbines; Plasma Control

20070024804 Leibniz Universitaet, Hannover, Germany
Acoustic Resonance in a High-Speed Axial Compressor
Seume, Joerg R.; Hellmich, Bernd; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Non-harmonic acoustic resonances were detected in the static pressure and sound signals in a four-stage high-speed axial compressor, when the compressor was operating close to the surge limit. Based on literature research and measurements of the resonance frequency, mach number of the mean flow, and the axial and circumferential phase shift of the pressure signal

during resonance, it is shown that the acoustic resonance is an axial standing wave of a spinning acoustic mode with three periods around the circumference of the compressor. This phenomenon occurs only if the aerodynamic load in the compressor is high, because the mode needs a high circumferential mach number for resonance conditions. The phenomenon of acoustic resonance is explained with a simplified model for helical acoustic modes of ducts. It is shown that, for this concrete case mode scattering, vortices waves and mode trapping between the blade pitch could be left unconsidered. The remaining model considers the flow in the compressor as rigid body. The swirl is considered for the calculation of cut-off conditions. From the resonance frequency and mode shape it turns out, that wave fronts of the measured mode running against the swirl of the mean flow are close to cut-off. This means that they are trapped or reflected at axial positions where the swirl in the compressor is maximal, behind the rotor rows. The waves traveling with the swirl can propagate through the compressor over wide parts of the operating map. But at low mass flow, the waves cannot pass the stator rows anymore because their incidence angle is changing due to changing flow conditions in such a way that the waves hit the stator blades from the suction side instead of hitting them from the pressure side. This means that they are reflected by the blade rows and so all waves of the mode are trapped between the rotor and stator rows.
Author
Acoustic Resonance; Axial Flow; High Speed; Turbomachinery; Turbocompressors; Computational Fluid Dynamics

20070024805 Universidad Politecnica de Madrid, Madrid, Spain
Linear Instability of the Flow Past a Low Pressure Turbine Blade
Theofilis, Vassilis; Abdessemed, Nadir; Sherwin, Spencer J.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781
Contract(s)/Grant(s): F49620-03-1-0295; Copyright; Available from CASI only as part of the entire parent document

The present work is concerned with linear BiGlobal instabilities of flow in a cascade of Low-pressure turbine (LPT) blades. In particular the three-dimensional instability of two-dimensional steady and timeperiodic basic states past a T106/3 blade has been investigated a high-order spectral/hp-element scheme and BiGlobal linear theory. The two-dimensional bifurcation of steady to time-periodic flow has first been identified at Re(sub 2d,crit approximately equal to 905). It has been shown that, subcritically, three-dimensional flow is more stable than its two-dimensional counterpart. Subsequently, Floquet analysis has shown that the time-periodic flow set up by linear amplification of the two-dimensional flow becomes three-dimensionally unstable soon after the two dimensional transition. Two modes of significance have been identified, associated to the separation bubble and the wake of the basic state. Three-dimensional DNS initialized on the identified Floquet eigenmodes at low amplitudes confirms the results of linear stability analysis. A narrow band of Floquet multipliers corresponding to unstable three-dimensional flow has been identified to exist and persist for all Reynolds numbers examined, 10(exp 3) < Re < 10(exp 4). However, relaxation of the periodic boundary conditions imposed in the present blade-cascade model affects the linear (modal) instability identified. First-ever transient-growth results of this essentially nonparallel flow have thus been obtained. In particular, the pseudo-spectrum of the flow under consideration has been identified and new mechanisms have been revealed, demonstrating the potential for three-dimensional transition as consequence of transient growth. The identified phenomenon already exists subcritically to Re(sub 2d,crit); given the quadratic dependence of the gain on Reynolds number, it is expected to persist in the Reynolds number of interest to applications. Further work to quantify the transient growth phenomenon is underway.
Author
Low Pressure; Turbine Blades; Linearity; Direct Numerical Simulation; Cascade Flow; Stability

20070024806 Cambridge Univ., UK
The Influence of Wakes, Freestream Turbulence, and Downstream Blade Rows on the Transition Mechanisms in LP Turbines
Opoka, Maciek; Thomas, Richard; Hodson, Howard; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The interaction of upstream wakes with the low Reynolds number boundary layer, and in particular the separation bubble, on the suction side of LPT airfoils has enabled the design of LPT airfoils with increased levels of lift. The aim of this paper is to describe the influence of freestream turbulence, upstream wakes and downstream bladerows on the laminar-turbulent transition mechanisms that result from this interaction. The study uses a linear cascade incorporating the T106A high lift Low Pressure Turbine blade. In order to reproduce the multistage LPT environment, two jointly driven systems of moving bars have been assembled upstream and downstream of the cascade and a turbulence grid was placed inside the cascade inlet duct. The upstream moving bar system is used to generate viscous wakes while the downstream moving bar system was designed to

reproduce the suction surface pressure oscillations associated with the potential fields of a downstream bladerow. The tests have been performed at a Reynolds number of 1.6 x 10(exp 5) and at inlet freestream turbulence intensities of 0.5% and 4.0%.
Derived from text
Turbulence; Wakes; Free Flow; Low Pressure; Turbine Blades; Cascade Flow; Transition Flow

20070024807 Oxford Univ., Oxford, UK
Unsteady Turbine Flows and Heat Fluxes at Oxford, Then and Now
Oldfield, Martin; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

The Oxford research into unsteady turbine aerodynamics and heat transfer over the last 3 decades is informally reviewed and discussed. The use of short duration facilities and transient high-bandwidth instrumentation techniques has been ideally suited to unravelling the inevitably unsteady flows in turbines. Early work in a short duration linear cascade used microsecond exposure schlieren photography to interpret unsteady phenomena seen in surface heat flux and pressure records. Phenomena observed include simulated wake and shock wave passing which cause large, rapid fluctuations in surface heat flux. These were related to measure heat flux changes by a deceptively simple theory. Shock waves passing the blade leading edge shed previously unseen vortex bubbles which when convected along the blade surface generating pulses of heat flux. Examination of the schlieren images reveal other phenomena, such as Mach waves shed by the von Karman vortices in the blade wakes and the unsteady passage vortex core.
Derived from text
Heat Flux; Turbines; Unsteady Aerodynamics; Unsteady Flow; Aerodynamic Heat Transfer; Computational Fluid Dynamics

20070024808 Ohio State Univ., Columbus, OH, USA
Aerodynamic and Heat Flux Measurements in a Fully Cooled HPT
Haldemann, C. W.; Mathison, R. M.; Dunn, M. G.; Southworth, S.; Harral, J. W.; Heitland, G.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

This presentation describes the experimental approach utilized to perform experiments using a fully cooled rotating turbine stage operating in a short-duration blowdown rig to obtain film effectiveness measurements. Significant changes to the previous experimental apparatus were implemented to meet the experimental objectives. The modifications include the development of a synchronized blowdown facility to provide cooling gas to the turbine stage, installation of a heat exchanger capable of generating a uniform or patterned inlet temperature profile, novel utilization of temperature and pressure instrumentation, and development of robust double-sided heat flux gauges. With these modifications, time-averaged and time-accurate measurements of temperature, pressure, surface heat flux, and film effectiveness can be made over a wide range of operational parameters duplicating the non-dimensional parameters necessary to simulate engine conditions. Data from low Reynolds number experiments are presented to demonstrate that all appropriate scaling parameters can be satisfied and that the new components have operated correctly. Along with airfoil surface heat transfer and surface pressure data, temperature and pressure data from inside the coolant plenums of the vane and rotating blade airfoils will be presented. Pressure measurements obtained inside the vane and blade plenum chambers illustrate passing of the wakes and shocks as a result of vane/blade interaction. The measurements noted above are presented in both time-averaged and time-accurate formats. The results include the heat transfer at multiple spans on the vane, blade, and rotor shroud as well as flow path measurements of total temperature and total pressure. Surface pressure measurements are presented for the vane and the blade at the mid span, location as well as the rotor shroud.
Author
Heat Flux; Aerothermodynamics; Film Cooling; Mechanical Engineering; High Pressure; Turbine Engines

20070024809 Leicester Univ., UK
Wake Interactions and the Pervasive Influence of the Calmed Region
Gostelow, Paul; Thomas, Richard; Adebayo, David; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Transition and separation phenomena occurring in axial flow compressors are simulated on a larger scale to provide further evidence on the similarities between turbomachinery and wind tunnel flows. A flat plate with a long laminar separation bubble, caused by a strong adverse pressure gradient, was subjected to wakes generated by rods moving transversely upstream

of the leading edge. Wakes were originally presented individually. Each individual wake provoked a vigorous turbulent patch, resulting in the instantaneous collapse of the separation bubble. This was followed by a very strong, and stable, calmed region. Following the lead given by the experiments of Gutmark and Blackwelder on triggered turbulent spots, wakes were then presented in pairs at different wake spacing intervals; in this way it was proposed to investigate wake interaction effects in more detail. As in the work on triggered turbulent spots the spacing between impinging wakes was systematically varied; it was found that for close wake spacings the calmed region acted to suppress the turbulence in the following turbulent patch. To investigate whether this phenomenon was a recurring one, or whether the flow then reverted back to its unperturbed state, the experiments were repeated with four rods instead of two. The variables encompassed a wide range of variables including direction and speed of rod rotation. It was found that the subsequent wakes were also suppressed by the calming effect. This repeating situation may also be anticipated in a turbomachine, resulting in benefits for efficiency, stall margin and heat transfer. Author

Wind Tunnels; Turbocompressors; Turbulent Wakes; Simulation; Boundary Layer Transition

20070024810 Arizona Univ., Tucson, AZ, USA

Numerical Investigation of Active Control for Low-Pressure Turbine Blades

Fasel, H. F.; Balzer, W.; Gross, A.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781

Contract(s)/Grant(s): FA9550-05-1-0166; Copyright; Available from CASI only as part of the entire parent document

Low-pressure turbine (LPT) stages are a common element of many modern jet engines. When operating conditions are detrimental or when more aggressive designs are considered, laminar separation from LPT blades can occur resulting in considerable performance losses. Several years ago it was shown by Rivir and coworkers at the Air Force Research Laboratory (AFRL) that active flow control (AFC) by vortex generator jets (VGJs) can significantly reduce the losses induced by laminar separation. Pulsed VGJs were found to be considerably more effective than steady VGJs. Steady blowing was shown to generate streamwise vortices (similar to conventional vortex generators) whereas pulsed blowing was shown to result in early boundary layer transition. Recently Bons et al. demonstrated that more aggressive LPT designs become possible when considering AFC from the very beginning. We are currently performing high resolution direct numerical simulations (DNS) where the computational domain has the same curvature and the flow is subjected to the same wall pressure distribution as in the PakB experiments at AFRL (R. Sondergaard, R. Rivir) and Brigham Young University (J. Bons). The comparison with earlier investigations, where we investigated AFC by VGJs for a generic flat-plate model, will help us determine the effect of flow curvature. A typical result for the curved geometry with pulsed VGJs and a duty cycle of 10% is shown.

Derived from text

Active Control; Low Pressure; Turbine Blades; Direct Numerical Simulation; Computational Fluid Dynamics; Vortex Generators

20070024811 Karlsruhe Univ., Germany

DNS of Flow and Heat Transfer in Turbine Cascades Under the Influence of Free Stream Disturbances

Rodi, W.; Wissink, J. G.; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

With the much increased computer resources available today, the complex flow and heat transfer processes in low-pressure turbine cascades can be studied in detail at realistic Reynolds numbers with the method of Direct Numerical Simulation (DNS). These processes involve by-pass transition under the influence of periodically oncoming wakes, laminar separation and subsequent transition and reattachment, which can be suppressed by the periodically passing wakes, and a strong influence of the free-stream turbulence, either distributed or concentrated in wakes, on the heat transfer in laminar and pre-transitional regions of the turbine-blade boundary layers. The present contribution reports on various DNS carried out to study these processes for flows in turbine-related geometries. First, DNS-results of the flow in a T106 LPT cascade are shown for Re = 5.18 x 10(exp 4) based on the approach flow velocity and the axial cord length, with passing wakes generated upstream by moving cylinders. In this case, in the adverse-pressure-gradient region on the suction side, the boundary layer tends to separate. The emphasis of this study was to differentiate between the effect of large-scale fluctuations (i.e. velocity deficit) in the wake and small-scale turbulent fluctuations, and hence in addition to the basic simulation with the wake having both a deficit and turbulence, simulations were carried out with the small-scale disturbances removed. This study shows that transition to turbulence strongly depends on the presence of small-scale disturbances. Further, DNS of the flow and heat transfer in a MTU cascade are presented for Re = 7.2 x 10(exp 4), simulating an experiment of Liu and Rodi. Calculations

are presented for various wake-passing frequencies. The unsteady wake data entering the computation domain were provided by Wu and Durbin of Stanford University. The mechanism of heat transfer affected by free-stream disturbances can be studied in detail. The influence of the wakes on the transition and the corresponding increase in heat transfer is predicted correctly, but the significant increase in heat transfer due to the passing wakes in the pre-transitional region on the suction side and in the fully laminar boundary layer on the pressure side is underpredicted. These differences are most likely due to the fact that the wake data of Wu and Durbin correspond to the far wake with relatively small-scale turbulence while in the experiments the wakes generated by moving cylinders contained larger vortical structures which are known to be more efficient for increasing laminar heat transfer. Calculation are under way, in which more realistic wake data stemming from an own DNS of cylinder flow are used as inflow data. Further, the effect of the length scale of free-stream turbulent fluctuations on laminar heat transfer is studied in a separate calculation for boundary layer flow within favourable pressure gradient. Results of these calculations are also presented.

Author

Direct Numerical Simulation; Cascade Flow; Free Flow; Turbine Blades; Laminar Heat Transfer; Heat Transfer

20070024812 Rolls-Royce Ltd., Derby, UK, NASA Glenn Research Center, Cleveland, OH, USA

Report of Industry Panel Group

Gallimore, Simon; Gier, Jochen; Heitland, Greg; Povinelli, Louis; Sharma, Om; VandeWall, Allen; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A final report is presented from the industry panel group. The contents include: 1) General comments; 2) Positive progress since Minnowbrook IV; 3) Industry panel outcome; 4) Prioritized turbine projects; 5) Prioritized compressor projects; and 6) Miscellaneous.

CASI

Compressors; Turbine Engines; Industries; Computational Fluid Dynamics

20070024813 Air Force Research Lab., Wright-Patterson AFB, OH, USA, Air Force Research Lab., Wright-Patterson AFB, OH, USA, Air Force Research Lab., Wright-Patterson AFB, OH, USA

Designing Turbine Airfoils to Answer Research Questions in Unsteady Aerodynamics

Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

Recently a complete design, analysis, and optimization system for turbine airfoils was implemented at the Air Force Research Laboratory. The system enables 2D and 3D design of turbine components using both traditional and design-optimization methods, and it allows for the advanced interrogation of unsteady flowfields. The design system is modular, and it currently leverages several government-funded analysis tools. These include the meanline analysis code and airfoil-shape algorithm due to Huber1, the 2D and 3D RANS solvers of Dorney and Davis, and the 2D and 3D LES solvers of Davis. Pre- and post-processing are handled through a GUI-based analysis system, and design can proceed using several optimization methods, including sequential quadratic programming, genetic algorithms, and design of experiments. The system also includes a novel means for assessing convergence in periodic-unsteady flows and for detecting time-resolved flow features of interest. The design system was created to allow the development of non-proprietary airfoil geometries that can be used throughout industry and academia for code validation and to help answer research questions in unsteady flows. Example geometries that were designed with the system are described along with the specific issues in unsteady flows to be investigated through testing of the components. These examples pertain to both high and low pressure turbines.

Derived from text

Airfoils; Unsteady Aerodynamics; Engine Design; High Pressure; Turbine Engines; Optimization

20070024814 Pratt and Whitney Aircraft, East Hartford, CT, USA

Impact of Surface Roughness in Axial Flow Gas Turbine Engines

Sharma, Om; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

A viewgraph presentation is given on the impact that surface roughness has on the performance of axial flow gas turbine engines, as well as compressors. The contents include: 1) Impact of surface roughness on heat transfer coefficients for a turbine

rotor airfoil; 2) Impact of surface roughness on profile losses for turbine (Speidel-1954) and compressor (Bammert and Milsch 1972) cascades; 3) Surface roughness effect on compressor airfoil performance (Bammert and Milsch-1972, ASME 72-GT-48); 4) Roughness induces separation at high RE#; and 5) Roughness reduces losses at low Reynolds numbers. A short summary is also provided on the surface roughness impact on turbines and compressors.
CASI
Axial Flow Turbines; Gas Turbine Engines; Surface Roughness; Surface Roughness Effects; Compressors

20070024815 MTU Aero Engines G.m.b.H., Munich, Germany
Unsteady CFD Simulations for IPC Off-Design Operating Conditions
Engel, Karl; Zscherp, Carsten; Nuernberger, Dirk; Kuegeler, Edmund; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery; December 2006; In English; See also 20070024781; Copyright; Available from CASI only as part of the entire parent document

An IPC is characterized by its extremely wide aerodynamic operating range with strong requirements concerning efficiency and surge margin. While the usual way of tackling this design goal is the introduction of variable stator vanes the approach chosen by MTU is the introduction of a powerful Casing Treatment. Thus the underlying multipoint design has to fulfill the mentioned requirements: Flow path and blade design for very high efficiency; Casing treatment design for maintaining surge margin in off-design operating conditions. This ambiguous goal leads to the demand for very sophisticated aerodynamic design tool capabilities like steady and time accurate flow prediction in fully turbulent and transitional flow regimes due to different operating conditions as well as the resolution of different geometry features outside the main flow path. In the paper the effect of different numerical resolution of the real geometry as well as the real behavior of the flow e.g. steady simulation vice time accurate simulations is discussed. The differences are analyzed and compared to rig-measurements.
Author
Computational Fluid Dynamics; Unsteady Aerodynamics; Engine Design; Axial Flow; Turbocompressors; Simulation

20070024891 NASA Glenn Research Center, Cleveland, OH, USA
Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery
LaGraff, John E., Editor; Ashpis, David E., Editor; Oldfield, Martin L. G., Editor; Gostelow, J. Paul, Editor; December 2006; 128 pp.; In English; Minnowbrook V: 2006 Workshop on Unsteady Flows in Turbomachinery, Aug. 20-23, 2006, Blue Mountain Lake, NY, USA; See also 20070024781; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNC06GA02G; FA9550-06-1-0174; WBS 561581.02.08.03.02.01
Report No.(s): NASA/CP-2006-214484; E-15776; Copyright; Avail.: CASI: A07, Hardcopy

This volume contains materials presented at the Minnowbrook V 2006 Workshop on Unsteady Flows in Turbomachinery, held at the Syracuse University Minnowbrook Conference Center, New York, on August 20-23, 2006. The workshop organizers were John E. LaGraff (Syracuse University), Martin L.G. Oldfield (Oxford University), and J. Paul Gostelow (University of Leicester). The workshop followed the theme, venue, and informal format of four earlier workshops: Minnowbrook I (1993), Minnowbrook II (1997), Minnowbrook III (2000), and Minnowbrook IV (2003). The workshop was focused on physical understanding of unsteady flows in turbomachinery, with the specific goal of contributing to engineering application of improving design codes for turbomachinery. The workshop participants included academic researchers from the USA and abroad and representatives from the gas-turbine industry and U.S. Government laboratories. The physical mechanisms discussed were related to unsteady wakes, active flow control, turbulence, bypass and natural transition, separation bubbles and turbulent spots, modeling of turbulence and transition, heat transfer and cooling, surface roughness, unsteady CFD, and DNS. The workshop summary and the plenary discussion transcripts clearly highlight the need for continued vigorous research in the technologically important area of unsteady flows in turbomachines. This volume contains abstracts and copies of select viewgraphs organized according to the workshop sessions. Full-color viewgraphs and animations are included in the CD-ROM version only (Doc.ID 20070024781).
Author (revised)
Turbomachinery; Unsteady Flow; Turbine Engines; Wakes; Cascade Flow; Applications Programs (Computers); Turbulence Models

20070024907 Lawrence Livermore National Lab., Livermore, CA USA
Two-Phase Model of Combustion in Explosions
Kunl, A. L.; Khasainov, B.; Bell, J.; Jun. 20, 2006; 14 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898484; UCRL-PROC-222284; No Copyright; Avail.: National Technical Information Service (NTIS)

A two-phase model for Aluminum particle combustion in explosions is proposed. It combines the gas-dynamic conservation laws for the gas phase with the continuum mechanics laws of multi-phase media, as formulated by Nigmatulin. Inter-phase mass, momentum and energy exchange are prescribed by the Khasainov model. Combustion is specified as material transformations in the Le Chatelier diagram which depicts the locus of thermodynamic states in the internal energy-temperature plane according to Kuhl. Numerical simulations are used to show the evolution of two-phase combustion fields generated by the explosive dissemination of a powdered Al fuel.
NTIS
Aluminum; Combustion; Explosions; Explosives; Two Phase Flow

20070024935 Savannah River National Lab., Aiken, SC, USA
Yield Stress Reduction of DWPF Melter Feed Slurries
Stone, M. E.; Smith, M. E.; January 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC09-96SR18500
Report No.(s): DE2007-899308; WSRC-STI-2006-00306; No Copyright; Avail.: National Technical Information Service (NTIS)

The Defense Waste Processing Facility (DWPF) at the Savannah River Site vitrifies High Level Waste for repository internment. The process consists of three major steps: waste pretreatment, vitrification, and canister decontamination/sealing. The HLW consists of insoluble metal hydroxides (primarily iron, aluminum, magnesium, manganese, and uranium) and soluble sodium salts (carbonate, hydroxide, nitrite, nitrate, sulfate). The pretreatment process acidifies the sludge with nitric and formic acids, adds the glass formers as glass frit, then concentrates the resulting slurry to approximately 50 weight percent (wt%) total solids. This slurry is fed to the joule-heated melter where the remaining water is evaporated followed by calcination of the solids and conversion to glass.
NTIS
Fluid Flow; Radioactive Wastes; Slurries; Waste Management

20070025023 NASA Glenn Research Center, Cleveland, OH, USA
Passive Endwall Treatments for Enhancing Stability
Hathaway, Michael D.; July 2007; 78 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 861726001.03.04.20.01
Report No.(s): NASA/TM-2007-214409; ARL-TR-3878; E-15688; Copyright; Avail.: CASI: A05, Hardcopy

These lecture notes were presented at the von Karman Institutes lecture series on Advances in Axial Compressor Aerodynamics, May 2006. They provide a fairly extensive overview of what's been learned from numerous investigations of various passive casing endwall technologies that have been proposed for alleviating the stall limiting physics associated with the compressor endwall flow field. The lecture notes are organized to give an appreciation for the inventiveness and understanding of the earliest compressor technologists and to provide a coherent thread of understanding that has arisen out of the early investigations. As such the lecture notes begin with a historical overview of casing treatments from their infancy through the earliest proposed concepts involving blowing, suction and flow recirculation. A summary of lessons learned from these early investigations is provided at the end of this section. The lecture notes then provide a somewhat more in-depth overview of recent advancements in the development of passive casing treatments from the late 1990's through 2006, including advancements in understanding the flow mechanism of circumferential groove casing treatments, and the development of discrete tip injection and self-recirculating casing treatments. At the conclusion of the lecture notes a final summary of lessons learned throughout the history of the development of passive casing treatments is provided. Finally, a list of future needs is given. It is hoped that these lecture notes will be a useful reference for future research endeavors to improve our understanding of the fluid physics of passive casing treatments and how they act to enhance compressor stability, and that they will perhaps provide a springboard for future research activities in this area of interest
Author
Aerodynamics; Stability; Axial Flow; Flow Distribution; Wall Flow; Turbocompressors; Casing

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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*.

20070023744 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Long-Wavelength Infrared (LWIR) Quantum Dot Infrared Photodetector (QDIP) Focal Plane Array
Gunapala, Sarath D.; Bandara, S. V.; Liu, J. K.; Hill, C. J.; Rafol, S. B.; Mumolo, J. M.; Shott, C. A.; April 17, 2006; 10 pp.; In English; SPIE Infrared Technology and Applications XXXII, 17-21 Apr. 2006, Orlando, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40113

We have exploited the artificial atomlike properties of epitaxially self-assembled quantum dots for the development of high operating temperature long wavelength infrared (LWIR) focal plane arrays. Quantum dots are nanometer-scale islands that form spontaneously on a semiconductor substrate due to lattice mismatch. QDIPs are expected to outperform quantum well infrared detectors (QWIPs) and are expected to offer significant advantages over II-VI material based focal plane arrays. QDIPs are fabricated using robust wide bandgap III-V materials which are well suited to the production of highly uniform LWIR arrays. We have used molecular beam epitaxy (MBE) technology to grow multi-layer LWIR quantum dot structures based on the InAs/InGaAs/GaAs material system. JPL is building on its significant QWIP experience and is basically building a Dot-in-the-Well (DWELL) device design by embedding InAs quantum dots in a QWIP structure. This hybrid quantum dot/quantum well device offers additional control in wavelength tuning via control of dot-size and/or quantum well sizes. In addition the quantum wells can trap electrons and aide in ground state refilling. Recent measurements have shown a 10 times higher photoconductive gain than the typical QWIP device, which indirectly confirms the lower relaxation rate of excited electrons (photon bottleneck) in QDPs. Subsequent material and device improvements have demonstrated an absorption quantum efficiency (QE) of approx. 3%. Dot-in-the-well (DWELL) QDIPs were also experimentally shown to absorb both 45 deg. and normally incident light. Thus we have employed a reflection grating structure to further enhance the quantum efficiency. JPL has demonstrated wavelength control by progressively growing material and fabricating devices structures that have continuously increased in LWIR response. The most recent devices exhibit peak responsivity out to 8.1 microns. Peak detectivity of the 8.1 micrometer devices has reached approx. 1 x 10(exp 10) Jones at 77 K. Furthermore, we have fabricated the first long-wavelength 640x512 pixels QDP focal plane array. This QDIP focal plane may has produced excellent infrared imagery with noise equivalent temperature difference of 40 mK at 60K operating temperature. In addition, we have managed to increase the quantum efficiency of these devices from 0.1% (according to the data published in literature) to 20% in discrete devices. This is a factor of 200 increase in quantum efficiency. With these excellent results, for the first time QDIP performance has surpassed the QWIP performance. Our goal is to operate these long-wavelength detectors at much higher operating temperature than 77K which can be passively achieved in space. This will be a huge leap in high performance infrared detectors specifically applicable to space science instruments.
Author
Infrared Radiation; Photometers; Quantum Dots; Focal Plane Devices; Fabrication

20070023787 Defense Science Board, Washington, DC USA
Report of the Defense Science Board Task Force on Defense Biometrics
Mar 2007; 179 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465930; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465930

A Defense Science Board Task Force was organized to address a number of issues relating to the use of Biometrics in the Department of Defense. The Terms of Reference (Appendix A) asked that specific organizational issues be addressed promptly and the Task Force provided an interim briefing that focused on these issues. While the terms of reference refer to 'biometrics,' the Task Force is convinced that identity management is the more inclusive and the more useful construct. The Task Force holds two companion theses. First, while we can come up with an endless set of scenarios in which biometrics might be called upon to play a role, with analysis and a little abstraction without losing the essence, the endless array of scenarios can be reduced to a compact set of 'use cases'. This compact set of use cases will help us appreciate our companion thesis, that a common 'back office' process (and associated 'data model') can be envisioned to service all the biometric, and thus Identity Management, use cases. That said, we clearly did not have either the time or the resources to study Identity

Management (IM) conclusively, especially in terms of the broadened set of organizational associations, use cases and Defense applications, and even social issues, attendant to that sprawling field.
DTIC
Biometrics; Defense Program; Identities; Security

20070023909 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Precision Clocks in Space and alpha-Variations
Prestage, John D.; Maleki, Lute; December 10, 2003; 9 pp.; In English; 2nd International Conference on Particle and Fundamental Physics in Space, 10-12 Dec. 2006, Washington, DC, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40097

Important developments of both in theoretical and observational cosmology have fueled considerable interest in searches for variations of the fine structure constant. Experimentally, Webb et. al. have found evidence for a cosmological variation of the fine structure constant through an analysis of the absorption lines in galactic halos from quasar-emitted light. Recently developed small ion atomic clocks enable Solar System tests for equivalence principle (EP) violating (alpha)-variations by way of rate-comparisons of three ultra-stable atomic clocks near-to and far-from the sun where gravitational red-shift changes are more than 10(exp 4) larger than in low Earth orbit. No space tests of the EP have been made in nearly 30 years, since the GP-A hydrogen maser reached a 10,000 km apogee confirming EP red-shift predictions ~1 part in 10(exp 4). Today's small ion clocks, nearly 100x more stable and 100x smaller then the GP-A H-maser, could probe for EP violating scalar fields near the sun for mission costs comparable to low Earth orbiters and improve the GP-A sensitivity by 5 to 6 orders of magnitude.
Author
Atomic Clocks; Variations; Mathematical Models; Solar System; Deep Space

20070023913 Texas A&M Univ., Corpus Christi, TX, USA, NASA Johnson Space Center, Houston, TX, USA
Real-Time Acquisition and Display of Data and Video
Bachnak, Rafic; Chakinarapu, Ramya; Garcia, Mario; Kar, Dulal; Nguyen, Tien; August 24, 2007; 7 pp.; In English; 7th International Conference on Applied Informatics and Communications (AIC '07), 24-26 August 2007, Athens, Greece; Original contains black and white illustrations
Contract(s)/Grant(s): NCC5-517; 0330822NSF; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023913

This paper describes the development of a prototype that takes in an analog National Television System Committee (NTSC) video signal generated by a video camera and data acquired by a microcontroller and display them in real-time on a digital panel. An 8051 microcontroller is used to acquire power dissipation by the display panel, room temperature, and camera zoom level. The paper describes the major hardware components and shows how they are interfaced into a functional prototype. Test data results are presented and discussed.
Author
Data Acquisition; Real Time Operation; Video Data; Display Devices; Video Equipment; Data Systems

20070023932 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Engineering the LISA Project: Systems Engineering Challenges
Evans, Jordan P.; March 4, 2006; 6 pp.; In English; IEEE Aerospace Conference, 4-11 March 2006, Big Sky, MT, USA; Original contains black and white illustrations
Report No.(s): IEEEAC Paper #1408; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40101

The Laser Interferometer Space Antenna (LISA) is a joint NASA/ESA mission to detect and measure gravitational waves with periods from 1 s to 10000 s. The systems engineering challenges of developing a giant interferometer, 5 million kilometers on a side, an: numerous. Some of the key challenges are presented in this paper. The organizational challenges imposed by sharing the engineering function between three centers (ESA ESTEC, NASA GSFC, and JPL) across nine time zones are addressed. The issues and approaches to allocation of the acceleration noise and measurement sensitivity budget terms across a traditionally decomposed system are discussed. Additionally, using LISA to detect gravitational waves for the

first time presents significant data analysis challenges, many of which drive the project system design. The approach to understanding the implications of science data analysis on the system is also addressed.
Author
LISA (Observatory); Systems Engineering; Space Missions; Black Holes (Astronomy); Gravitational Waves

20070024885 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Three Years of Hyperspectral Data from AIRS: What Have We Learned
Aumann, Hartmut. H.; Chahine, Moustafa T.; Pagano, Thomas S.; June 12, 2006; 38 pp.; In English; European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Satellite Conference 2006, 12-16 Jun. 2006, Helsinki, Finland; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40125

This viewgraph presentation reviews the Atmospheric Infrared Sounder (AIRS) that is on the Aqua satellite. The expectations that were had about AIRS have been exceeded. The lessons learned from AIRS are reviewed. These lessons are used to enhance the next generation hyperspectral sounder, being planned.
CASI
Infrared Instruments; Atmospheric Sounding; Satellite Sounding

20070025066 Tope-McKay and Associates, Malibu, CA, USA
Cadmium-Zinc-Telluride Detectors
Harrison, Flona A., Inventor; Cook, Walter, Inventor; Chen, Chen, Chi Ming Hubert, Inventor; Kecman, Branislav, Inventor; Mao, Peter Hsih-Jer, Inventor; Schindler, Stephen M., Inventor; Bumham, Jill, Inventor; 4 Aug. 2005; 22 pp.; In English
Contract(s)/Grant(s): NAS7-1407
Patent Info.: Filed 20 Aug. 2004; US-Patent-Appl-10/923249; US 2005/0167606
Report No.(s): PB2007-102939; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025066

The present invention relates to cadmium-zinc-telluride (CdZnTe) detectors. More specifically, the present invention relates CdZnTe pixel detectors that are optimized for astrophysical applications.
Author
Cadmium Tellurides; Zinc Tellurides; Detectors; Sensors

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20070023769 Air Force Research Lab., Wright-Patterson AFB, OH USA
Rechargeable Lithium-Ion Based Batteries and Thermal Management for Airborne High Energy Electric Lasers (Preprint)
Fellner, Joseph P; Miller, Ryan M; Shanmugasundaram, Venkatrama; Aug 2006; 10 pp.; In English
Contract(s)/Grant(s): F33615-03-C-2348; F33600-02-D-2001; Proj-3145
Report No.(s): AD-A465856; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465856

Advances in the past decade of the energy and power densities of lithium-ion based batteries for hybrid electric vehicles and various consumer applications have been substantial. Rechargeable high rate lithium-ion batteries are now exceeding 6 kW/kg for short discharge times <15 seconds). Rechargeable lithium-ion polymer batteries, for applications such as remote-control aircraft, are achieving simultaneously high energy density and high power density (>160 Whr/kg at > 1.0 kW/kg). Some preliminary test data on a rechargeable lithium-ion polymer battery is presented. The use of high rate rechargeable lithium-ion batteries as a function of onboard power, electric laser power level, laser duty cycle, and total mission

time is presented. A number of thermal management system configurations were examined to determine system level weight impacts. Lightweight configurations would need a regenerative thermal energy storage subsystem.
DTIC
Airborne Lasers; Electric Batteries; High Power Lasers; Lithium; Lithium Batteries; Metal Ions; Safety; Temperature Control; Weapon Systems

20070024660 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Performance Achievements and Challenges for FELS Based on Energy Recovered Linacs
Krafft, G. A.; January 2006; 5 pp.; In English
Report No.(s): DE2007-896952; No Copyright; Avail.: Department of Energy Information Bridge
During the past decade several groups have assembled free electron lasers based on energy recovered linacs (ERLs). Such arrangements have been built to obtain high average power electron and photon beams, by using high repetition rate beam pulses driving FEL oscillators. In this paper the performance of many existing and several proposed facilities from around the world are reviewed. Going forward, many questions must be addressed to achieve still better performance including: higher average current injectors, better optimized accelerating cavities, higher energy acceptance and lower loss beam recirculation systems, and better optical cavity designs for dealing with the optical beam power circulating in the ERL FELs. This paper presents some of the current thinking on each of these issues.
NTIS
Free Electron Lasers; Linear Accelerators; Test Facilities

20070024661 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA, Old Dominion Univ., Norfolk, VA, USA
General Model of the Resistive Wall Instability in Linear Accelerations
Delayen, J. R.; Wu, J.; Jan. 2007; 3 pp.; In English
Report No.(s): DE2007-896955; JLAB-ACP-07-609; No Copyright; Avail.: National Technical Information Service (NTIS)
A general model for wakefield-generated instabilities in linear accelerators, originally developed for cumulative beam breakup (1), is applied to the resistive wall instability. The general solution for various bunch charge distributions and application to various accelerator configurations are presented.
NTIS
Linear Accelerators; Mathematical Models

20070024774 Adams (John) High School, South Bend, IN, USA, Central Lab. of the Research Councils, Chilton, UK, High Energy Accelerator Research Organization, Ibaraki, Japan, Centre National de la Recherche Scientifique, Orsay, France
Study of Laser System Requirements for Application in Beam Diagnostics and Polarimetry at the ILC
Dixit, S.; Delerue, N.; Foster, B.; Howell, D. F.; Peach, K.; January 2007; 3 pp.; In English
Report No.(s): DE2007-899567; SLAC-PUB-12329; No Copyright; Avail.: Department of Energy Information Bridge
Advanced laser systems will be essential for a range of diagnostics devices and polarimetry at the ILC. High average power, high beam quality, excellent stability and reliability will be crucial in order to deliver the information required to attain the necessary ILC luminosity as well as for efficient polarimetry. The key parameters are listed together with the R & D required to achieve the necessary laser system performance.
NTIS
Laser Applications; Lasers; Linear Accelerators; Polarimetry

20070024776
Laser-Wire System at the ATF Extraction Line
Boogert, S. T.; Blair, G.; Boorman, G.; Bosco, A.; Deacon, L.; January 2007; 4 pp.; In English
Report No.(s): DE2007-899568; SLAC-PUB-12328; No Copyright; Avail.: National Technical Information Service (NTIS)
A new laser-wire (LW) system has been installed at the ATF extraction line at KEK, Tsukuba. The system aims at a micron-scale laser spot size and employs a mode-locked laser system. The purpose-built interaction chamber, light delivery optics, and lens systems are described, and the first results are presented.
NTIS
Extraction; Lasers; Wire; Optics

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*.

20070024450 MacMillan, Sobanski and Todd, LLC, Toledo, OH, USA
Magnetic Suspension and Drive System for Rotating Equipment
Jansen, Ralph H., Editor; Kascak, Peter E., Editor; Dever, Timothy P., Editor; 28 Sep. 2006; 12 pp.; In English
Contract(s)/Grant(s): NCC3-916; NCC3-924
Patent Info.: Filed 28 Feb. 2005; US-Patent-Appl-60/068560; US 2006/0214525
Report No.(s): PB2007-101447; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024450

An electromagnetic suspension and rotary drive system comprises at least one conical bearingless motor/generator. Each conical bearingless motor/generator comprises a rotatable part and a stationary part. The rotatable part has an axis of rotation with respect to the stationary part. The stationary part has one or more windings for producing a drive field and a control field. The drive field is provided for exerting a torque on the rotatable part to transfer energy between the rotatable part and the stationary part. The control field is provided for exerting a force on the rotatable part to levitate the rotatable part. The force exerted by the conical bearingless motor/generator is adapted to be directed at an angle greater than 0.degree. and less than 90.degree. relative to the axis of rotation of the rotatable part.
Author
Magnetic Suspension; Mechanical Drives; Magnetic Fields

20070024824 Ford Motor Co., Dearborn, MI, USA, FEV Engine Technology, Inc., Auburn Hills, MI, USA, Mobil Research and Development Corp., Paulsboro, NJ, USA
Advanced CIDI Emission Control System Development Final Report Final Report
Lambert, C.; Jun. 30, 2006; 71 pp.; In English
Contract(s)/Grant(s): FC26-01NT41103
Report No.(s): DE2007-898797; No Copyright; Avail.: National Technical Information Service (NTIS)

Ford Motor Company, with ExxonMobil and FEV, participated in the Department of Energy's (DOE) Ultra-Clean Transportation Fuels Program with the goal to develop an innovative emission control system for light-duty diesel vehicles. The focus on diesel engine emissions was a direct result of the improved volumetric fuel economy (up to 50%) and lower CO2 emissions (up to 25%) over comparable gasoline engines shown in Europe. Selective Catalytic Reduction (SCR) with aqueous urea as the NOx reductant and a Catalyzed Diesel Particulate Filter (CDPF) were chosen as the primary emission control system components. The program expected to demonstrate more than 90% durable reduction in particulate matter (PM) and NOx emissions on a light-duty truck application, based on the FTP-75 drive cycle. Very low sulfur diesel fuel (<15 ppm-wt) enabled lower PM emissions, reduced fuel economy penalty due to the emission control system and improved long-term system durability. Significant progress was made toward a durable system to meet Tier 2 Bin 5 emission standards on a 6000 lbs light-duty truck. A 40% reduction in engine-out NOx emissions was achieved with a mid-size prototype diesel engine through engine recalibration and increased exhaust gas recirculation. Use of a rapid warm-up strategy and urea SCR provided over 90% further NOx reduction while the CDPF reduced tailpipe PM to gasoline vehicle levels. Development work was conducted to separately improve urea SCR and CDPF system durability, as well as improved oxidation catalyst function. Exhaust gas NOx and ammonia sensors were also developed further. While the final emission control system did not meet Tier 2 Bin 5 NOx after 120k mi of aging on the dynamometer, it did meet the standards for HC, NMOG, and PM, and an improved SCR catalyst was shown to have potential to meet the NOx standard, assuming the DOC durability could be improved further. Models of DOC and SCR function were developed to guide the study of several key design factors for SCR systems and aid in the development of urea control strategy for maximum NOx reduction with minimum NH3 slip. A durable co-fueling system was successfully built and tested, with the help of service station nozzle and dispenser manufacturers, for simultaneous delivery of diesel fuel and aqueous urea to the vehicle. The business case for an aqueous urea infrastructure in the US for light-duty vehicles was explored.
NTIS
Diesel Engines; Systems Engineering

20070025068 Troutman Sanders , LLP, Atlanta, GA, USA
Stagnation Point Reverse Flow Combustor for a Combustion System
Zinn, Ben T., Inventor; Neumeier, Yedidia, Inventor; Seitzman, Jerry M., Inventor; Jagoda, Jechiel, Inventor; Hashmomay, Ben-Amil, Inventor; 9 Feb. 2006; 29 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-982
Patent Info.: Filed 11 May 2005; US-Patent-Appl-SN-127038; US 2006/0029894
Report No.(s): PB2007-103934; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025068

A combustor assembly includes a combustor vessel having a wall, a proximate end defining an opening and a closed distal end opposite said proximate end. A manifold is carried by the proximate end. The manifold defines a combustion products exit. The combustion products exit being axially aligned with a portion of the closed distal end. A plurality of combustible reactant ports is carried by the manifold for directing combustible reactants into the combustion vessel from the region of the proximate end towards the closed distal end.
Author
Combustion; Combustion Chambers; Stagnation Point

38
QUALITY ASSURANCE AND RELIABILITY

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

20070023750 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Clean then Assemble Versus Assemble then Clean: Several Comparisons
Welker, Roger W.; June 17, 2004; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40034

Cleanliness of manufactured parts and assemblies is a significant issue in many industries including disk drives, semiconductors, aerospace, and medical devices. Clean manufacturing requires cleanroom floor space and cleaning technology that are both expensive to own and expensive to operate. Strategies to reduce these costs are an important consideration. One strategy shown to be effective at reducing costs is to assemble parts into subassemblies and then clean the subassembly, rather than clean the individual parts first and then assemble them. One advantage is that assembly outside of the cleanroom reduces the amount of cleanroom floor space and its associated operating cost premium. A second advantage is that this strategy reduces the number of individual parts that must be cleaned prior to assembly, reducing the number of cleaning baskets, handling and, possibly, reducing the number of cleaners. The assemble then clean strategy also results in a part that is significantly cleaner because contamination generated during the assembly steps are more effectively removed that normally can be achieved by hand wiping after assembly in the cleanroom.
Author
Assembling; Cleaning; Cleanliness; Cost Reduction; Clean Rooms; Controlled Atmospheres

20070025095 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Comparison of JPL and European Environmental Testing Standards
Man, Kin Fung; Forgave, John C.; Hoffman, Alan R.; March 20, 2006; 16 pp.; In English; 2nd International Workshop on Verification and Testing of Space Systems, 20-22 Mar. 2006, Turin, Italy; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40115

A comparison of JPL and European environmental testing standards is presented. The contents include: 1) JPL Environmental Testing Documents; 2) Focus of the Comparison; 3) Test Policy; 4) Documentation; 5) Programmatics; 6) Functional Testing; 7) Reporting; 8) Dynamics Test Levels, Durations, & Margins; 9) Thermal Test Levels, Durations, & Margins; and 10) EMC Test Levels, Durations, & Margins.
CASI
Standards; Environmental Tests; Europe; Aerospace Engineering

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20070024898 National Center for Atmospheric Research, Boulder, CO USA, Space Environment Center, Boulder, CO, USA, Boston Coll., Chestnut Hill, MA, USA

Low Energy Auroral Electron and Ion Hemispheric Power after NOAA and DMSP Intersatellite Adjustments

Emery, B. A.; Evans, D. S.; Greer, M. S.; Holeman, E.; Rich, F. J.; Dec. 2006; 80 pp.; In English

Report No.(s): PB2007-105588; No Copyright; Avail.: National Technical Information Service (NTIS)

Twenty-eight years of low energy auroral electron (Hpe) or total (Hpt, electron plus ion) hemispheric power estimates from 11 NOAA (< 20 keV) and 11 DMSP (<30 keV) satellites are adjusted to produce consistent electron hemispheric power (Hpe) estimates for the south and north hemispheres. Most satellites sample the nighttime aurora in the southern hemisphere, so the hemispheric power estimates are more consistent (i.e. better) in the southern hemisphere. The low energy (<20 keV) auroral ion hemispheric power (Hpi) estimates are found from the SEM-2 NOAA instruments beginning in 1998. The ion hemispheric power is the difference of the estimated total hemispheric power minus the estimated electron hemispheric power (i.e. Hpi = Hpt - Hpe). The ion hemispheric power estimates are less reliable than the corresponding electron hemispheric power estimates, especially in the northern hemisphere.

NTIS

Auroras; Dmsp Satellites; Electron Energy; Southern Hemisphere; Ions

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*.

20070023751 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

High Lapse Rates in AIRS Retrieved Temperatures in Cold Air Outbreaks

Fetzer, Eric J.; Kahn, Brian; Olsen, Edward T.; Fishbein, Evan; August 9, 2004; 9 pp.; In English; 13th Conference on Interactions of the Sea and Atmosphere, 9-13 August 2004, Portland, ME, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40033

The Atmospheric Infrared Sounder (AIRS) experiment, on NASA's Aqua spacecraft, uses a combination of infrared and microwave observations to retrieve cloud and surface properties, plus temperature and water vapor profiles comparable to radiosondes throughout the troposphere, for cloud cover up to 70%. The high spectral resolution of AIRS provides sensitivity to important information about the near-surface atmosphere and underlying surface. A preliminary analysis of AIRS temperature retrievals taken during January 2003 reveals extensive areas of superadiabatic lapse rates in the lowest kilometer of the atmosphere. These areas are found predominantly east of North America over the Gulf Stream, and, off East Asia over the Kuroshio Current. Accompanying the high lapse rates are low air temperatures, large sea-air temperature differences, and low relative humidities. Imagery from a Visible / Near Infrared instrument on the AIRS experiment shows accompanying clouds. These lines of evidence all point to shallow convection in the bottom layer of a cold air mass overlying warm water, with overturning driven by heat flow from ocean to atmosphere. An examination of operational radiosondes at six coastal stations in Japan shows AIRS to be oversensitive to lower tropospheric lapse rates due to systematically warm near-surface air temperatures. The bias in near-surface air temperature is seen to be independent of sea surface temperature, however. AIRS is therefore sensitive to air-sea temperature difference, but with a warm atmospheric bias. A regression fit to radiosondes is used to correct AIRS near-surface retrieved temperatures, and thereby obtain an estimate of the true atmosphere-ocean thermal contrast in five subtropical regions across the north Pacific. Moving eastward, we show a systematic shift in this air-sea temperature differences toward more isothermal conditions. These results, while preliminary, have implications for our understanding of heat flow from ocean to atmosphere. We anticipate future improvements in the AIRS retrieval algorithm will

lead to improved understanding of the exchange of sensible and latent heat from ocean to atmosphere, and more realistic near-surface lapse rates.
Author
Air Water Interactions; Atmospheric Moisture; Cloud Cover; Heat Transmission; Temperature Gradients; Temperature Profiles; Atmospheric Temperature; Northern Hemisphere; Air Masses

20070023908 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Comparison of Coincident Multiangle Imaging Spectroradiometer and Moderate Resolution Imaging Spectroradiometer Aerosol Optical Depths over Land and Ocean Scenes Containing Aerosol Robotic Network Sites
Abdou, Wedad A.; Diner, David J.; Martonchik, John V.; Bruegge, Carol J.; Kahn, Ralph A.; Gaitley, Barbara J.; Crean, Kathleen A.; Remer, Lorraine A.; Holben, Brent; Journal of Geophysical Research; April 6, 2005; Volume 110; 12 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40046; http://dx.doi.org/10.1029/2004JD004693

The Multiangle Imaging Spectroradiometer (MISR) and the Moderate Resolution Imaging Spectroradiometer (MODIS), launched on 18 December 1999 aboard the Terra spacecraft, are making global observations of top-of-atmosphere (TOA) radiances. Aerosol optical depths and particle properties are independently retrieved from these radiances using methodologies and algorithms that make use of the instruments corresponding designs. This paper compares instantaneous optical depths retrieved from simultaneous and collocated radiances measured by the two instruments at locations containing sites within the Aerosol Robotic Network (AERONET). A set of 318 MISR and MODIS images, obtained during the months of March, June, and September 2002 at 62 AERONET sites, were used in this study. The results show that over land, MODIS aerosol optical depths at 470 and 660 nm are larger than those retrieved from MISR by about 35% and 10% on average, respectively, when all land surface types are included in the regression. The differences decrease when coastal and desert areas are excluded. For optical depths retrieved over ocean, MISR is on average about 0.1 and 0.05 higher than MODIS in the 470 and 660 nm bands, respectively. Part of this difference is due to radiometric calibration and is reduced to about 0.01 and 0.03 when recently derived band-to-band adjustments in the MISR radiometry are incorporated. Comparisons with AERONET data show similar patterns.
Author
MISR (Radiometry); MODIS (Radiometry); Optical Thickness; Aerosols; Robotics; Communication Networks; Land; Oceans

20070024818 NASA Stennis Space Center, Stennis Space Center, MS, USA
Assessing Potential of VIIRS Data for Contribution to a Forest Threat Early Warning System
Spruce, Joseph P.; July 11, 2007; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNS04AB54T
Report No.(s): SSTI-2220-0109; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024818

This viewgraph presentation reviews the contributions by the Rapid Prototyping Capability (RPC) towards using Visible Infrared Imager / Radiometer Suite (VIIRS) data in assessing the damage to forests. The Healthy Forest Restoration Act of 2003 mandates development of national Early Warning System (EWS) for forest threat monitoring and mitigation. NASA Stennis is working with the US Forest Service to develop needed components of this EWS. The use of MODIS data for monitoring forest disturbance at broad regional scales is a componet of this program. This RPC experiment was initiated to assess potential of the MODIS follow-on, VIIRS, for monitoring forest disturbance at broad scales and thereby contributing to the EWS. This presentation reviews the potential use of the VIIRS to examine the damage to forests caused by gyspy moths in the West Virginia and Virginia area.
CASI
Damage; Forests; Imaging Spectrometers; Forest Fires; Fire Prevention; Satellite Observation; Vegetative Index; Canopies (Vegetation); Trees (Plants); Remote Sensing

20070025097 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Prototype Geostationary Synthetic Thinned Aperture Radiometer (GeoSTAR) for Atmospheric Temperature Sounding
Tanner, Alan B.; Lambrigsten, B. H.; Brown, S. T.; Wilson, W. J.; Piepmeier, J. R.; Ruf, C. S.; Lim, B.; February 28, 2006; 38 pp.; In English; 9th Specialist Meeting on Microwave Radiometry and Remote Sensing Applications, 28 Feb. - 3 Mar. 2006, San Juan, Puerto Rico; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40127

A viewgraph presentation of a prototype Geostationary Synthetic Thinned Aperture Radiometer (GeoSTAR) for

atmospheric temperature sounding is shown. The topics include: 1) Overview; 2) Requirements & Error allocations; 3) Design; 4) Problems, and How We Solved Them; and 5) Results
CASI
Atmospheric Sounding; Atmospheric Temperature; Synthetic Apertures; Prototypes; Microwave Radiometers; Geosynchronous Orbits

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*; and *28 Propellants and Fuels*.

20070023719 NASA Johnson Space Center, Houston, TX, USA
Fuel Cell Development for NASA's Human Exploration Program: Benchmarking with 'The Hydrogen Economy'
Scott, John H.; [2007]; 8 pp.; In English
Contract(s)/Grant(s): 038957.04.01.03.10; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023719

The theoretically high efficiency and low temperature operation of hydrogen-oxygen fuel cells has motivated them to be the subject of much study since their invention in the 19th Century, but their relatively high life cycle costs kept them as a 'solution in search of a problem' for many years. The first problem for which fuel cells presented a truly cost effective solution was that of providing a power source for NASA's human spaceflight vehicles in the 1960 s. NASA thus invested, and continues to invest, in the development of fuel cell power plants for this application. This development program continues to place its highest priorities on requirements for minimum system mass and maximum durability and reliability. These priorities drive fuel cell power plant design decisions at all levels, even that of catalyst support. However, since the mid-1990's, prospective environmental regulations have driven increased governmental and industrial interest in 'green power' and the 'Hydrogen Economy.' This has in turn stimulated greatly increased investment in fuel cell development for a variety of commercial applications. This investment is bringing about notable advances in fuel cell technology, but, as these development efforts place their highest priority on requirements for minimum life cycle cost and field safety, these advances are yielding design solutions quite different at almost every level from those needed for spacecraft applications. This environment thus presents both opportunities and challenges for NASA's Human Exploration Program
Author
Fuel Cell Power Plants; Energy Conversion; NASA Programs; Technology Utilization; Hydrogen-Based Energy

20070023781 Electrodynamics Associates, Inc., Oviedo, FL USA
Closed Loop Controlled High Speed Induction Generators Using Adaptive Control Technique (Preprint)
Vaidya, Jay; Elkhomri, Ottman; Gregory, Earl; Jul 2006; 7 pp.; In English
Contract(s)/Grant(s): F33615-00-C-2018; Proj-3005
Report No.(s): AD-A465899; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465899

This report was developed under a SBIR contract. High speed generators offer a very high power density solution for electric power requirements in airborne applications. Induction generators are suitable for the high speed environment because of the ability to provide controlled voltage and power output with a reliable rotor construction. An important issue of power control for the high speed induction generator is maintenance of the steady state output voltage within the specified limits over the entire range of speed and load variations. This paper discusses the development of a closed loop control system for a 200 kW induction generator under different load conditions.
DTIC
Adaptive Control; Feedback Control; High Speed

20070023783 Bulgarian Academy of Sciences, Sofia, Bulgaria
Mechanism of Thermal Runaway in VRLA Batteries and Methods to Suppress It - Phase II
Pavlov, Detchko; Mar 2007; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N62558-06-P-0070
Report No.(s): AD-A465904; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465904

The aim of this project is to elucidate the mechanism of thermal runaway in VRLA batteries and especially the eventual

role of the AGM separator. The oxygen evolution (OER) and oxygen recombination reactions (ORR) proceed in the cells, and the only work done by the input power is to transfer water from anode to cathode through these reactions, the remaining energy being dissipated as heat. The heat generators in the cell are the electrochemical reactions through their activation overpotentials, the exothermic chemical reactions and the exothermicity of ORR plus Joule Ohmic heating in electrolyte and solid phases. We have shown that, within the range of currents used (up to 1C), the major contribution comes from electrochemical reactions. The cell temperature is at most in a first order dependence of recombinant current. The OER at constant applied voltage and fixed ambient temperature is accelerated by the rise of internal cell temperature and overpotential, as the negative plate is depolarized by ORR due to enhanced separator permeability for oxygen flow by electrolyte displacement and/or drying and negative plate local desaturation. If the negative plate potential is stabilized at Pb/PbSO4 potential and cannot be shifted by any current applied, the cell behaviour is controlled solely by OER reaction. Thus, a lower applied voltage is enough to produce a current sufficient to generate conditions for thermal runaway. The results obtained in this study suggest strongly that by modification of separator properties it is possible to achieve better thermal control, in concert with other cell design improvements, plus the usual external measures as power input management and passive/active cooling.
DTIC
Electric Batteries; Failure; Lead Acid Batteries; Thermal Batteries

20070023794 California Inst. of Tech., Pasadena, CA USA
Multi-Paradigm Multi-Scale Simulations for Fuel Cell Catalysts and Membranes
Goddard, III, W; Merinov, B; Duin, A van; Jacob, T; Blanco, M; Molinero, V; Jang, S S; Jang, Y H; Jan 2006; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DE-FG01-04ER04-20; DE-FC26-02NT41631
Report No.(s): AD-A465963; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465963

Dramatically improving the performance of fuel cell systems with their complex heterogeneous structures involving electrocatalysts, proton conducting membrane, reactant, and interfaces between them requires understanding the fundamental chemical, electrochemical, and physical phenomena at the heart of these complex materials and relating these fundamentals to the properties and performance of the membrane electrode assembly. Our goal is to develop a predictive model that can be used to estimate the changes in performance upon changes in the design and which can be used to monitor performance of working fuel cells. Our strategy is to start with first principles quantum mechanics (QM) and to develop overlapping simulation methodologies in which QM is used to train a reactive force field that can be applied for large-scale (millions of atom) molecular dynamics simulations while retaining the accuracy of QM. The results of molecular dynamics are used to extract a coarse grain or mesoscale description useful in modeling properties at much larger scales. This model would enable the conception, synthesis, fabrication, characterization, and development of advanced materials and structures for fuel cells and for the associated hydrocarbon fuel reformers in an overall fuel cell system. We illustrate here some of the progress toward this goal.
DTIC
Catalysts; Electrocatalysts; Electrolytic Cells; Fuel Cells; Membranes; Molecular Dynamics; Quantum Mechanics; Simulation

20070024427 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Validation Database Based Thermal Analysis of an Advanced RPS Concept
Balint, Tibor S.; Emis, Nickolas D.; February 12, 2006; 8 pp.; In English; Space Technology and Applications International Forum, STAIF-2006, 12-16 Feb. 2006, Albuquerque, NM, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40099

Advanced RPS concepts can be conceived, designed and assessed using high-end computational analysis tools. These predictions may provide an initial insight into the potential performance of these models, but verification and validation are necessary and required steps to gain confidence in the numerical analysis results. This paper discusses the findings from a numerical validation exercise for a small advanced RPS concept, based on a thermal analysis methodology developed at JPL and on a validation database obtained from experiments performed at Oregon State University. Both the numerical and experimental configurations utilized a single GPHS module enabled design, resembling a Mod-RTG concept. The analysis focused on operating and environmental conditions during the storage phase only. This validation exercise helped to refine key thermal analysis and modeling parameters, such as heat transfer coefficients, and conductivity and radiation heat transfer

values. Improved understanding of the Mod-RTG concept through validation of the thermal model allows for future improvements to this power system concept.
Author
Data Bases; Thermal Analysis; Thermoelectric Generators; Mathematical Models; Radioisotope Heat Sources

20070024702 California Univ., Oakland, CA, USA
Semiconductor- Nanocrystal/Conjugated Polymer Thin Films
Allvisatos, A. P., Inventor; Dittmer, J. J., Inventor; Huynh, W. U., Inventor; Milliron, D., Inventor; 11 Feb 05; 29 pp.; In English
Contract(s)/Grant(s): DE-AC03-76SF000-98
Patent Info.: Filed Filed 11 Feb 05; US-Patent-Appl-SN-11-056-430
Report No.(s): PB2007-102626; No Copyright; Avail.: CASI: A03, Hardcopy

The invention described herein provides for thin films and methods of making comprising inorganic semiconductor-nanocrystals dispersed in semiconducting-polymers in high loading amounts. The invention also describes photovoltaic devices incorporating the thin films.
NTIS
Conjugation; Nanocrystals; Photovoltaic Conversion; Semiconductors (Materials); Thin Films

20070024731 Long Island Power Authority, Uniondale, NY, USA
Fuel Cell Demonstration Program--Central and Remote Sites 2003 (Final Report, April 24, 2003-June 30, 2006)
Brun, G.; Sep. 2006; 24 pp.; In English
Contract(s)/Grant(s): DE-FG26-03NT42019
Report No.(s): DE2007-899249; No Copyright; Avail.: Department of Energy Information Bridge

In an effort to promote clean energy projects and aid in the commercialization of new fuel cell technologies, the Long Island Power Authority (LIPA) initiated a Fuel Cell Demonstration Program in 1999 with six month deployments of Proton Exchange Membrane (PEM) non-commercial Beta model systems at partnering sites throughout Long Island. These projects facilitated significant developments in the technology, providing operating experience that allowed the manufacturer to produce fuel cells that were half the size of the Beta units and suitable for outdoor installations.
NTIS
Fuel Cells; Membranes

20070024733 White and Case, LLP, New York, NY, USA
Apparatus and Method for Optimizing the Efficiency of Germanium Junctions in Multi-Junction Solar Cells
Stan, M. A., Inventor; Li, N. Y., Inventor; Spadafora, F. A., Inventor; Hou, H. Q., Inventor; Sharps, P. R., Inventor; 2 Jun 05; 9 pp.; In English
Patent Info.: Filed Filed 2 Jun 05; US-Patent-Appl-SN-11-143 516
Report No.(s): PB2007-105903; No Copyright; Avail.: CASI: A02, Hardcopy

In a preferred embodiment, an indium gallium phosphide (InGaP) nucleation layer is disposed between the germanium (Ge) substrate and the overlying dual-junction epilayers for controlling the diffusion depth of the n-doping in the germanium junction. Specifically, by acting as a diffusion barrier to arsenic (As) contained in the overlying epilayers and as a source of n-type dopant for forming the germanium junction, the nucleation layer enables the growth time and temperature in the epilayer device process to be minimized without compromising the integrity of the dual-junction epilayer structure. This in turn allows the arsenic diffusion into the germanium substrate to be optimally controlled by varying the thickness of the nucleation layer. An active germanium junction formed in accordance with the present invention has a typical diffused junction depth that is 1/5 to 1/2 of that achievable in prior art devices. Furthermore, triple junction solar cells incorporating a shallow n-p germanium junction of the present invention can attain 1 sun AM0 efficiencies in excess of 26%.
NTIS
Fabrication; Germanium; Solar Cells; Junction Diodes

20070024734 Quallion, LLC, Sylmar, CA, USA
Battery Having Electrolyte Including Organoborate Salt
Yoon, S. Y., Inventor; Nakahara, H., Inventor; Tsukamoto, H., Inventor; 21 Oct 04; 26 pp.; In English
Contract(s)/Grant(s): NIST-70NANB043022; DE-W-31-109-ENG-38
Patent Info.: Filed Filed 21 Oct 04; US-Patent-Appl-SN-10-971-912
Report No.(s): PB2007-104222; No Copyright; Avail.: CASI: A03, Hardcopy

The battery includes an electrolyte activating one or more cathodes and one or more anodes. The electrolyte includes one or more mono(bidentate)borate salts in a solvent. The solvent includes a silane or a siloxane. The mono(bidentate)borate salt can include a lithium dihalo mono(bidentate)borate such as lithium difluoro oxalatoborate (LiDfOB).
NTIS
Electric Batteries; Electrolytes; Patent Applications

20070024822 Argonne National Lab., IL USA
Comparative Costs of Flexible Package Cells and Rigid Cells for Lithium-Ion Hybrid Electric Vehicle Batteries
January 2007; 44 pp.; In English
Report No.(s): DE2007-898525; ANL-06/43; No Copyright; Avail.: National Technical Information Service (NTIS)

We conducted a design study to compare the manufacturing costs at a level of 100,000 hybrid vehicle batteries per year for flexible package (Flex) cells and for rigid aluminum container (Rigid) cells. Initially, the Rigid cells were considered to have welded closures and to be deep-drawn containers of about the same shape as the Flex cells. As the study progressed, the method of fabricating and sealing the Rigid cells was expanded to include lower cost options including double seaming and other mechanically fastened closures with polymer sealants. Both types of batteries were designed with positive electrodes containing Li(Ni1/3Co1/3Mn1/3)O2 and graphite negative electrodes. The use of a different combination of lithium-ion electrodes would have little effect on the difference in costs for the two types of cells. We found that 20-Ah cells could be designed with excellent performance and heat rejection capabilities for either type of cell. Many parts in the design of the Flex cells are identical or nearly identical to those of the Rigid Cell, so for these features there would be no difference in the cost of manufacturing the two types of batteries. We judged the performance, size and weight of the batteries to be sufficiently similar that the batteries would have the same value for their application.
NTIS
Cost Analysis; Costs; Electric Batteries; Electric Motor Vehicles; Lithium; Manufacturing; Metal Ions

20070024903 Long Island Power Authority, Uniondale, NY, USA
Fuel Cell Demonstration Program-Central and Remote Sites 2002
Brun, G.; Aug. 01, 2006; 20 pp.; In English
Contract(s)/Grant(s): DE-FG26-03NT42021
Report No.(s): DE2007-898112; No Copyright; Avail.: National Technical Information Service (NTIS)

New fuel cell technologies the Long Island Power Authority (LIPA) initiated a Fuel Cell Demonstration Program in 1999 with six month deployments of Proton Exchange Membrane (PEM) non-commercial Beta model systems at partnering sites throughout Long Island. These projects facilitated significant developments in the technology, providing operating experience that allowed the manufacturer to produce fuel cells that were half the size of the Beta units and suitable for outdoor installations. In 2001, LIPA embarked on a large-scale effort to identify and develop measures that could improve the reliability and performance of future fuel cell technologies for electric utility applications and the concept to establish a fuel cell farm (Farm) of 75 units was developed. By the end of October of 2001, 75 Lorax 2.0 fuel cells had been installed at the West Babylon substation on Long Island, making it the first fuel cell demonstration of its kind and size anywhere in the world at the time. Designed to help LIPA study the feasibility of using fuel cells to operate in parallel with LIPAs electric grid system, the Farm operated 120 fuel cells over its lifetime of over 3 years including 3 generations of Plug Power fuel cells (Lorax 2.0, Lorax 3.0, Lorax 4.5). Of these 120 fuel cells, 20 Lorax 3.0 units operated under this Award from June 2002 to September 2004. In parallel with the operation of the Farm, LIPA recruited government and commercial/industrial customers to demonstrate fuel cells as on-site distributed generation. From December 2002 to February 2005, 17 fuel cells were tested and monitored at various customer sites throughout Long Island. The 37 fuel cells operated under this Award produced a total of 712,635 kWh. As fuel cell technology became more mature, performance improvements included a 1% increase in system efficiency. Including equipment, design, fuel, maintenance, installation, and decommissioning the total project budget was approximately $3.7 million.
NTIS
Fuel Cells; Membranes

20070024905 Electricore, Inc., Valencia, CA, USA, AeroVironment, Inc., Monrovia, CA, USA
Advanced Modular Inverter Technology Development
Szczepanek, A.; Jan. 20, 2006; 68 pp.; In English
Contract(s)/Grant(s): DE-FC26-04NT41972
Report No.(s): DE2007-898117; No Copyright; Avail.: National Technical Information Service (NTIS)

The overall objective of this program was to design, build, and test prototype inverter systems that are low cost, producible, reliable, modular, and scalable that can be used by both vehicle and distributed energy systems. Building on a successful history of power control and conditioning research and development programs, AeroVironment developed and tested a unique, advanced inverter packaging technology. This program leverages existing initial inverter packaging technology results to develop a low cost inverter, while providing the ability to operate in automotive under the hood environment and virtually no changes in production methods. Thus, the objective of this research was to improve advanced inverter packaging technology to a pre-commercial stage that will allow for a reduction of weight and size of power electronics and is scalable over a wide power range of 30 to 500kW.
NTIS
Electric Motor Vehicles; Electric Potential; Inverters

20070024980 Beijing Municipal Hydrogeological and Engineering Geological Corp., Beijing, China
Exploring the Economic Value of EPAct 2005's PV Tax Credits
Bolinge, M.; Ing, E.; Wiser, R.; Mar. 28, 2006; 10 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898858; LBNL--59928; No Copyright; Avail.: National Technical Information Service (NTIS)

The market for grid-connected photovoltaics (PV) in the US has grown dramatically in recent years, driven in large part by PV grant or buy-down programs in California, New Jersey, and many other states. The recent announcement of a new 11-year, $3.2 billion PV program in California suggests that state policy will continue to drive even faster growth over the next decade. Federal policy has also played a role, primarily by providing commercial PV systems access to tax benefits, including accelerated depreciation (5-year MACRS schedule) and a business energy investment tax credit (ITC).
NTIS
Economics; Supplying; Photovoltaic Conversion

20070024981 National Renewable Energy Lab., Golden, CO USA
Potential for Hydrogen Production from Renewable Resources in the USA
Milbrandt, A.; Mann, M.; Feb. 2007; 32 pp.; In English
Report No.(s): DE2007-899141; NREL/TP-640-41134; No Copyright; Avail.: National Technical Information Service (NTIS)

This study estimates the potential for hydrogen production from key renewable resources (onshore wind, solar photovoltaic, and biomass) by county in the USA. It includes maps that allow the reader to easily visualize the results.
NTIS
Hydrogen; Hydrogen Production; United States

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20070024668 Michigan Univ., Ann Arbor, MI, USA
Engineered Natural Geosorbents for In Situ Immobilization of DNAPLs and Heavy Metals
Weber, W. J.; Nov. 29, 2006; 84 pp.; In English
Contract(s)/Grant(s): DE-FG07-02ER63488
Report No.(s): DE2007-897826; No Copyright; Avail.: National Technical Information Service (NTIS)

Extensive subsurface contamination by dense non-aqueous phase liquid (DNAPL) organic solvents and heavy metals is common place at many DOE facilities. Poor performances and excessive costs have made traditional technologies and approaches less than satisfactory for remediation of such sites. It is increasingly apparent that marginal improvements in

conventional methods and approaches will not suffice for clean up of many contaminated DOE sites. Innovative approaches using new and/or existing technologies in more efficient and cost-effective ways are thus urgently required.
NTIS
Heavy Metals; Environmental Cleanup; Waste Treatment; Toxic Hazards; Environment Management

20070024726 Bechtel Nevada Corp., Las Vegas, NV, USA
Soil-Related Input Parameters for the Biosphere Model (September 2006)
Wasiolek, M.; Oct. 2006; 134 pp.; In English
Contract(s)/Grant(s): DE-AC28-01RW12101
Report No.(s): DE2007-899228; ANL-NBS-MD-000009-REV-03; No Copyright; Avail.: National Technical Information Service (NTIS)

This report presents one of the analyses that support the Environmental Radiation Model for Yucca Mountain Nevada (ERMYN), referred to in this report as the biosphere model. Biosphere Model Report (BSC 2004 (DIRS 169460)) describes the details of the conceptual and mathematical biosphere models and the required input parameters. The biosphere model is one of a series of process models supporting the postclosure total system performance assessment (TSPA) for the Yucca Mountain repository.
NTIS
Biosphere; Environment Models; Mountains; Soil Science

20070024825 Argonne National Lab., IL, USA
Critical Review of Mercury Chemistry in Flue Gas
Mendelsohn, M. H.; Liverpood, C. D.; Nov. 27, 2006; 98 pp.; In English
Contract(s)/Grant(s): DE-AC02-06CH11357
Report No.(s): DE2007-898529; ANL/ESD/06-4; No Copyright; Avail.: Department of Energy Information Bridge

This report begins by summarizing the survey process and describing how the results were used to shape the critical review. Analyses of information obtained from the various publications are presented chronologically, beginning with the earliest relevant publication found and concluding with the end of the review in early 2003. Finally, the conclusions and recommendations for future research are presented. The survey instrument is included in Appendix A, while detailed information on each of the publications reviewed is given in Appendix B.
NTIS
Flue Gases; Surveys; Mercury (Metal)

20070024827 Argonne National Lab., IL, USA
Development and Applications of GREET 2.7 -- The Transportation Vehicle-Cycle Model
Bomham, A.; Wang, M. Q.; Wu, Y.; Dec. 20, 2006; 124 pp.; In English
Contract(s)/Grant(s): DE-AC02-06CH11357
Report No.(s): DE2007-898530; ANL/ESD/06-5; No Copyright; Avail.: National Technical Information Service (NTIS)

Argonne National Laboratory has developed a vehicle-cycle module for the Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET) model. The fuel-cycle GREET model has been cited extensively and contains data on fuel cycles and vehicle operations. The vehicle-cycle model evaluates the energy and emission effects associated with vehicle material recovery and production, vehicle component fabrication, vehicle assembly, and vehicle disposal/recycling. With the addition of the vehicle-cycle module, the GREET model now provides a comprehensive, lifecycle-based approach to compare the energy use and emissions of conventional and advanced vehicle technologies (e.g., hybrid electric vehicles and fuel cell vehicles). This report details the development and application of the GREET 2.7 model. The current model includes six vehicles a conventional material and a lightweight material version of a mid-size passenger car with the following powertrain systems: internal combustion engine, internal combustion engine with hybrid configuration, and fuel cell with hybrid configuration. The model calculates the energy use and emissions that are required for vehicle component production; battery production; fluid production and use; and vehicle assembly, disposal, and recycling. This report also presents vehicle-cycle modeling results. In order to put these results in a broad perspective, the fuel-cycle model (GREET 1.7) was used in conjunction with the vehicle-cycle model (GREET 2.7) to estimate total energy-cycle results.
NTIS
Air Pollution; Automobile Fuels; Exhaust Gases; Greenhouse Effect; Transportation

20070024831 North Carolina Univ., Chapel Hill, NC, USA

Modeling the Transport and Chemical Evolution of Onshore and Offshore Emissions and their Impact on Local and Regional Air Quality Using a Variable-Grid-Resolution Air Quality Model Semi-Annual

Alapaty, K.; Apr. 16, 2006; 14 pp.; In English

Contract(s)/Grant(s): FC26-03NT15466OSOQOPOS

Report No.(s): DE2007-898786; No Copyright; Avail.: National Technical Information Service (NTIS)

This Annual report summarizes the research performed from 17 April 2005 through 16 April 2006. Major portions of the research in several of the projects current eight tasks have been completed. We have successfully developed the meteorological inputs using the best possible modeling configurations, resulting in improved representation of atmospheric processes. The development of the variable-grid-resolution emissions model, SMOKE-VGR, is also completed. The development of the MAQSIP-VGR has been completed and a test run was performed to ensure the functionality of this air quality model. We have incorporated new emission data base to update the offshore emissions. However, we have faced some bottleneck problems in the testing the integrity of the new database. For this reason, we have asked for a no-cost extension of this project to tackle these scientific problems. Thus, the project is on a one-year delay schedule. During the reporting period, we solved all problems related to the new emission database. We are ready to move to developing the final product, implementation and testing of the variable grid technology into the Community Multiscale Air Quality Model (CMAQ) to develop the CMAQ-VGR. During the upcoming months we will perform the first CMAQ-VGR simulations over the Houston-Galveston region to study the roles of the meteorology, offshore emissions, and chemistry-transport interactions that determine the temporal and spatial evolution of ozone and its precursors.

NTIS

Air Pollution; Air Quality; Chemical Evolution; Environment Models

20070024883 Government Accountability Office, Washington, DC, USA

Legislative Branch: Energy Audits Are Key to Strategy for Reducing Greenhouse Gas Emissions

Apr. 2007; 53 pp.; In English

Report No.(s): PB2007-108729; GAO-07-516; No Copyright; Avail.: CASI: A04, Hardcopy

Because of concerns about changes in Earth's climate due to greenhouse gas emissions and the potential economic and environmental consequences of these changes, GAO (1) inventoried greenhouse gas emissions generated by legislative branch operations in fiscal year 2006, as well as identified trends in emissions starting from a base year of the average annual amount emitted in fiscal years 1998 through 2001, and (2) identified a strategy for reducing emissions. To perform this work, GAO followed the Greenhouse Gas Protocol and additional guidance from the Environmental Protection Agency, using data provided by officials responsible for legislative branch operations and the General Services Administration.

NTIS

Energy Policy; Exhaust Emission; Exhaust Gases; Greenhouse Effect

20070024906 Environmental Protection Agency, Washington, DC, USA

National Surface Water Survey Eastern Lake Survey (Phase II-Temporal Variability). Quality Assurance Plan

Jun. 1988; 270 pp.; In English

Report No.(s): PB2007-109527; EPA/600/R-88/083; No Copyright; Avail.: CASI: A12, Hardcopy

The Eastern Lake Survey - Phase II (ELS-II) was conducted in spring, summer, and fall of 1986 as part of the U. S. Environmental Protection Agency's (EPA) National Surface Water Survey (NSWS).The NSWS is a contribution to the National Acid Precipitation Assessment Program (NAPAP), which was charged by the U.S. Congress to provide policymakers with sound technical information regarding the effects of acid deposition.The major component of ELS-II was the spring, summer, and fall seasonal surveys and Fall Variability Study of lakewater chemistry in the northeastern USA. ELS-II lakes were sampled once in the spring, summer, and fall at the same location on the lake where the ELS-I sample was collected. In the fall variability study, a subset of ELS-II lakes was sampled on two additional dates at two independently selected locations believed to be the deepest point in the lake. ELS-II data, in conjunction with ELS-I data can be used to assess between-year, within-season, and among-season chemical variability, as well as spatial variability due to site selection.

NTIS

Annual Variations; Dictionaries; Information Systems; Lakes; Quality Control; Surface Water; Surveys; United States; Variability; Water Pollution

20070024916 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Evaluating Health Benefits of Air Pollution Reductions: Recent Developments at the U.S. EPA
Hubbell, B. J.; January 2001; 17 pp.; In English
Report No.(s): PB2007-108598; No Copyright; Avail.: CASI: A03, Hardcopy

The analysis of expected health benefits of reductions in air pollution is of great importance both in Europe and the USA. The emergence of strong evidence that air pollution is contributing to significant increases in premature mortality has provided support for a number of recent efforts to reduce air pollution through regulation of both mobile and stationary sources. Dr. Pearce has provided an overview of recent European experiences with health benefits analysis. The purpose of this paper is to describe recent developments in the science and art of health benefits analysis of air pollution regulations at the U.S. Environmental Protection Agency.

NTIS
Air Pollution; Public Health; Europe; United States

20070024917 Environmental Protection Agency, Washington, DC, USA
Health Benefits of Reducing Particulate Air Pollution from Heavy Duty Vehicles
Hubbell, B. J.; Koman, T.; Fox, T. J.; Possiel, N.; Stella, G.; January 2007; 39 pp.; In English
Report No.(s): PB2007-108597; No Copyright; Avail.: CASI: A03, Hardcopy

The U.S. Environmental Protection Agency (U.S.EPA) recently promulgated regulations to reduce air pollution from heavy-duty vehicles. This article reports the estimated health benefits of reductions in ambient particulate matter (PM) concentrations associated with those regulations based on the best available methods of benefits analysis. The results suggest that when heavy-duty vehicle emission reductions from the regulation are fully realized in 2030, they will result in substantial, broad scale reductions in ambient particulate matter. This will reduce the incidence of premature mortality by 8,300, chronic bronchitis by 5,500, and respiratory and cardiovascular hospital admissions by 7,500. In addition, over 175,000 asthma attacks and millions of respiratory symptoms will be avoided in 2030. The economic value of these health benefits is estimated at over $65 billion.

NTIS
Air Pollution; Particulates; Motor Vehicles; Public Health

20070024933 Westinghouse Savannah River Co., Aiken, SC, USA
Hybrid Sulfur Electrolyzer Development (October 1, 2006-December 31, 2006)
January 2006; 42 pp.; In English
Report No.(s): DE2007-899305; WSRC-STI-2006-00393; No Copyright; Avail.: National Technical Information Service (NTIS)

The proof of concept of SO2 electrolysis for the hybrid sulfur (HyS) process is the second priority research target of the DOE Nuclear Hydrogen Initiatives thermochemical program for FY07. The proof of concept of the liquid-phase option must be demonstrated at the single cell level for an extended run times (>100 hours). The rate of development of HyS will depend on the identification of a promising membrane or an alternative means for controlling sulfur formation. Once successful long-duration operation has been demonstrated, SRNL will develop a multi-cell stack that can be connected to the H2SO4 decomposer being developed by SNL for the S-I ILS for a Hybrid Sulfur Integrated Laboratory-Scale Experiment during FY 2008. During the first quarter of FY07, SRNL continued the component development and membrane development activities with the goal of identifying and characterizing improved electrodes, electrocatalysts, membranes and MEA configurations which could then be tested at larger scale in the SDE test facility. A modified glass cell was fabricated to allow measurements of sulfur dioxide (SO2) transport across membrane samples at elevated temperatures (up to 70 DGC). This testing also includes evaluating SO2 transport in different sulfuric acid concentrations (30 - 70 wt%). A new potentiostat/frequency analyzer was installed for determining ionic conductivity of membranes. This instrument enhances our capabilities to characterize membrane, electrocatalyst and MEA properties and performance.

NTIS
Electrolysis; Sulfur; Sulfur Dioxides

20070024998 Battelle Columbus Labs., OH USA, Illinois Dept. of Commerce and Community Affairs, Springfield, IL, USA
Environmental Technology Verification (ETV) Testing of Four Mercury Emission Sampling Systems: Apex Instruments, Environmental Suppl Company, Tekran Instruments Corporation, and Thermo Electron
Kelly, T.; Satola, J.; Willenberg, Z.; Dindal, A.; Feb. 2007; 144 pp.; In English
Contract(s)/Grant(s): ICCI-04-1/3.2D-1
Report No.(s): PB2007-108680; EPA/600/R-07/052; No Copyright; Avail.: CASI: A07, Hardcopy

The U.S. Environmental Protection Agency (EPA) supports the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing highquality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies. ETV works in partnership with recognized testing organizations; with stakeholder groups consisting of buyers, vendor organizations, and permitters; and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests, collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible.
NTIS
Air Pollution; Pollution Control; Proving; Sampling; Mercury (Metal)

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*.

20070023934 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Sporadic E Morphology from GPS-CHAMP Radio Occultation
Wu, Dong L.; Ao, Chi O.; Hajj, George A.; de la Torre Juarez, Manuel; Mannucci, Anthony J.; Journal of Geophysical Research; January 19, 2005; Volume 110, A01306; 18 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NSF-ATM-0210088; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40042; http://dx.doi.org/10.1029/2004JA010701

The scintillations of phase and amplitude in terms of signal-to-noise ratio (SNR) of the GPS radio occultation signal are caused by thin ionization layers. These thin irregular electron density layers in the E region ionosphere are often called sporadic E (Es). For a monthly retrieval of Es morphology we use the variances of the phase and SNR fluctuations of worldwide ~6000 GPS/CHAMP occultations in the E region. The Es climatology is studied globally with the SNR and phase variances in terms of monthly zonal means, seasonal maps, and diurnal and long-term variations. The zonal mean variances reveal strong, extended Es activities at summertime midlatitudes but weak, confined activities in wintertime high latitudes, peaking at ~105 km. Global maps at 105-km altitude show clear dependence of Es activities on the geomagnetic dip angle, where the summertime midlatitude Es occurs mostly at dip angles of 30 deg. - 60 deg. and the wintertime high-latitude enhancement occurs mostly at dip angles greater than 80 deg. The midlatitude Es variances exhibit a strong semidiurnal variation with peak hours near 0800 1000 and 2000 local solar time, respectively. The peak hours are delayed slightly with decreasing height, suggesting influences from the semidiurnal tide. To provide more insights on the observed SNR and phase variances, we model radio wave propagation for the CHAMP observing geometry under several perturbed cases in the E region ionosphere. The model simulations indicate that the SNR variance has the maximum response to Es perturbations at vertical wavelengths of 1.2 km, whereas the phase response maximizes at ~2 km (for the 1-s variance analysis). The characteristic scale depends little on the truncation time used in the SNR variance analysis, but it increases with the truncation time for the phase variances. Initial studies show that reasonable global Es morphology can be produced on a monthly and seasonal basis with the CHAMP one-antenna occultations. Better results from other existing and upcoming GPS occultation missions are anticipated in future studies, and they will significantly improve our understanding of this important phenomenon.
Author
Global Positioning System; Radio Occultation; Sporadic E Layer; Morphology; Geophysics

20070024429 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Nighttime Cirrus Detection using Atmospheric Infrared Sounder Window Channels and Total Column Water Vapor

Kahn, Brian H.; Liou, Kuo Nan; Lee, Sung-Yung; Fishbein, Evan F.; DeSouza-Machado, Sergio; Eldering, Annmarie; Fetzer, Eric J.; Hannon, Scott E.; Strow, L. Larrabee; Journal of Geophysical Research D07203, doi:10.1029/2004JD005430,2005; April 2, 2005; Volume 110; 13 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NGT5-30372; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40083; http://dx.doi.org/10.1029/2004JD005430

A method of cirrus detection at nighttime is presented that utilizes 3.8 and 10.4 (micro)m infrared (IR) window brightness temperature differences (dBT) and total column precipitable water (PW) measurements. This technique is applied to the Atmospheric Infrared Sounder (AIRS) and Advanced Microwave Sounding Unit A (AMSU-A) instrument suite on board EOS-Aqua, where dBT is determined from sets of carefully selected AIRS window channels, while PW is derived from the synergistic AIRS and AMSU-A water vapor retrievals. Simulated and observed dBT for a particular value of PW are not constant; several physical factors impact dBT, including the variability in temperature and relative humidity profiles, surface emissivity, instrument noise, and skin/ near-surface air temperature differences. We simulate clear-sky dBT over a realistic range of PWs using 8350 radiosondes that have varying temperature and relative humidity profiles. Thresholds between cloudy and uncertain sky conditions are derived once the scatter in the clear-sky dBT is determined. Simulations of optically thin cirrus indicate that this technique is most sensitive to cirrus optical depth in the 10 (micro)m window of 0.1-0.15 or greater over the tropical and subtropical oceans, where surface emissivity and skin/near-surface air temperature impacts on the IR radiances are minimal. The method at present is generally valid over oceanic regions only, specifically, the tropics and subtropics. The detection of thin cirrus, and other cloud types, is validated using observations at the Atmospheric Radiation Measurement (ARM) program site located at Manus Island in the tropical western Pacific for 89 coincident EOS-Aqua overpasses. Even though the emphasis of this work is on the detection of thin cirrus at nighttime, this technique is sensitive to a broad cloud morphology. The cloud detection technique agrees with ARM-detected clouds 82-84% of the time, which include thin cirrus, as well as other cloud types. Most of the disagreements are well explained by AIRS footprint-scale heterogeneity compared to ARM point measurements, cirrus overlying lower-layer water clouds, possible mixed phase microphysics in midlevel clouds, and significant IR channel noise for cold BT scenes over deep convective towers.

Author

Infrared Instruments; Water Vapor; Cirrus Clouds; Detection; Atmospheric Windows; Atmospheric Sounding; Night Sky

20070024687 Lawrence Livermore National Lab., Livermore, CA USA

Seismic Safety Study

Tokarz, F. J.; Coats, D. W.; May 2006; 30 pp.; In English

Report No.(s): DE2007-899412; UCRL-TR-221420; No Copyright; Avail.: National Technical Information Service (NTIS)

During the past three decades, the Laboratory has been proactive in providing a seismically safe working environment for its employees and the general public. Completed seismic upgrades during this period have exceeded $30M with over 24 buildings structurally upgraded. Nevertheless, seismic questions still frequently arise regarding the safety of existing buildings. To address these issues, a comprehensive study was undertaken to develop an improved understanding of the seismic integrity of the Laboratory's entire building inventory at the Livermore Main Site and Site 300. The completed study of February 2005 extended the results from the 1998 seismic safety study per Presidential Executive Order 12941, which required each federal agency to develop an inventory of its buildings and to estimate the cost of mitigating unacceptable seismic risks. Degenkolb Engineers, who performed the first study, was recontracted to perform structural evaluations, rank order the buildings based on their level of seismic deficiencies, and to develop conceptual rehabilitation schemes for the most seriously deficient buildings. Their evaluation is based on screening procedures and guidelines as established by the Interagency Committee on Seismic Safety in Construction (ICSSC).

NTIS

Safety; Seismology; Buildings; Structural Engineering

20070024902 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA

Proceedings of the Fourth International Workshop on Seismic Design and Retrofit of Transportation Facilities (on CD-ROM)

Apr. 03, 2006; In English

Report No.(s): PB2007-500038; MCEER-06-SP03; No Copyright; Avail.: National Technical Information Service (NTIS)

This CD-ROM contains the papers and presentations from a workshop focusing on the use of large-scale experimental facilities with a special session devoted to recently constructed facilities in Japan (NIED-E defense shake table in Miki),

Taiwan (NCREE Strong Floor and Tri-Axial Seismic Simulator in Taipei) and the USA (NSF-NEES facilities located throughout the country). The formal part of the workshop was followed by a two-day study tour to three of the NEES facilities in the San Francisco area, at the Universities of California at Berkeley and Davis, and the University of Nevada, Reno. The workshop concluded with the joint formulation of resolutions and goals for future international collaboration in the area of seismic design and retrofit of transportation facilities. Materials from the workshop are available from the MCEER website.
NTIS
CD-ROM; Conferences; Earthquakes; Transportation

20070025000 Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY, USA
Study of the Coupled Horizontal-Vertical Behavior of Elastomeric and Lead-Rubber Seismic Isolation Bearings
Warn, G. P.; Whittaker, A. S.; Sep. 22, 2006; 344 pp.; In English
Contract(s)/Grant(s): DTFH61-98-C-00094
Report No.(s): PB2007-108679; MCEER-06-0011; No Copyright; Avail.: National Technical Information Service (NTIS)

This report presents an analytical and experimental investigation of the coupled horizontal-vertical response of elastomeric and lead-rubber bearings focusing on the influence of lateral displacement on the vertical stiffness. Component testing was performed with reduced scale low-damping rubber (LDR) and lead-rubber (LR) bearings to determine the vertical stiffness at various lateral offsets. The numerical studies included finite element (FE) analysis of the reduced scale LDR bearing. The results of the experimental and FE investigations were used to evaluate three analytical formulations to predict the vertical stiffness at a given lateral displacement. The results of simulations performed with three components of excitation were used to evaluate an equivalent linear static (ELS) procedure for the estimation of the vertical load due to the vertical ground shaking. References, tables and figures are included, as well as 4 appendices at the end of the report.
NTIS
Earthquake Resistant Structures; Elastomers; Isolation; Rubber; Vibration Isolators; Bearings

20070025089 NASA Johnson Space Center, Houston, TX, USA
Evidence from Polymict Ureilite Meteorites for a Single 'Rubble-Pile' Ureilite Parent Asteroid Gardened by Several Distinct Impactors
Downes, Hilary; Mittlefehldt, David W.; Kita, Noriko T.; Valley, John W.; [2008]; 48 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Ureilites are ultramafic achondrite meteorites that have experienced igneous processing whilst retaining heterogeneity in mg# and oxygen isotope ratios. Polymict ureilites represent material derived from the surface of the ureilite parent asteroid(s). Electron microprobe analysis of more than 500 olivine and pyroxene clasts in six polymict ureilites reveals that they cover a statistically identical range of compositions to that shown by all known monomict ureilites. This is considered to be convincing evidence for derivation from a single parent asteroid. Many of the polymict ureilites also contain clasts that have identical compositions to the anomalously high Mn/Mg olivines and pyroxenes from the Hughes 009 monomict ureilite (here termed the Hughes cluster). Four of the six samples also contain distinctive ferroan lithic clasts that have been derived from oxidized impactors. The presence of several common distinctive lithologies within the polymict ureilites is additional evidence that the ureilites were derived from a single parent asteroid. Olivine in a large lithic clast of augite-bearing ureilitic has an mg# of 97, extending the compositional range of known ureilite material. Our study confirms that ureilitic olivine clasts with mg#s < 85 are much more common than those with mg# > 85, which also show more variable Mn contents, including the melt-inclusion bearing 'Hughes cluster' ureilites. We interpret this to indicate that the parent ureilite asteroid was disrupted by a major impact at a time when melt was still present in regions with a bulk mg# > 85, giving rise to the two types of ureilites: common ferroan ones that were already residual after melting and less common magnesian ones that were still partially molten when disruption occurred, some of which are the result of interaction of melts with residual mantle during disruption. A single daughter asteroid re-accreted from the disrupted remnants of the mantle of the proto-ureilite asteroid, giving rise to a 'rubble-pile' body that had material of a wide variety of compositions and shock states present on its surface. The analysed polymict ureilite meteorites represent regolith that subsequently formed on this asteroidal surface, including impact-derived material from at least six different meteoritic sources.
Author
Ureilites; Achondrites; Meteorites; Impactors; Asteroids; Breccia; Pyroxenes

20070025112 Frontier Research System for Global Change, Tokyo, Japan, NASA Ames Research Center, Moffett Field, CA, USA

Investigation of Polar Stratospheric Cloud Solid Particle Formation Mechanisms Using ILAS and AVHRR Observations in the Arctic

Irie, H.; Pagan, K. L.; Tabazadeh, A.; Legg, M. J.; Sugita, T.; Geophysical Research Letters; August 10, 2004; Volume 31, L15107; 4 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNA04CC40A; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2004GL020246

Satellite observations of denitrification and ice clouds in the Arctic lower stratosphere in February 1997 are used with Lagrangian microphysical box model calculations to evaluate nucleation mechanisms of solid polar stratospheric cloud (PSC) particles. The occurrences of ice clouds are not correlated in time and space with the locations of back trajectories of denitrified air masses, indicating that ice particle surfaces are not always a prerequisite for the formation of solid PSCs that lead to denitrification. In contrast, the model calculations incorporating a pseudoheterogeneous freezing process occurring at the vapor-liquid interface can quantitatively explain most of the observed denitrification when the nucleation activation free energy for nitric acid dihydrate formation is raised by only approx.10% relative to the current published values. Once nucleated, the conversion of nitric acid dihydrate to the stable trihydrate phase brings the computed levels of denitrification closer to the measurements. INDEX TERMS: 0305 Atmospheric Composition and Structure: Aerosols and particles (0345, 4801); 0320 Atmospheric Composition and Sb~lctureC: loud physics and chemistry; 0340 Atmospheric Composition and Structure: Middle atmosphere-composition and chemistry

Author

Ice Clouds; Atmospheric Composition; Chemical Composition; Arctic Regions; Polar Meteorology; Middle Atmosphere; Nucleation; Advanced Very High Resolution Radiometer

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070023711 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Remote Sounding of Atmospheric Gravity Waves with Satellite Limb and Nadir Techniques

Wu, Dong L; Preusse, Peter; Eckermann, Stephen D; Jiang, Jonath H; delaTorre Juarez, Manuel; Coy, Lawrence; Wang, Ding Y; Advances in Space Research; August 31, 2005; Volume 27, Issue 12, pp. 2269-2277; In English; Original contains color illustrations

Report No.(s): AD-A461334; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/100.2/ADA461334; http://dx.doi.org/10.1016/j.asr.2005.07.031

Recent advances in satellite techniques hold great potential for mapping global gravity wave (GW) processes at various altitudes. Poor understanding of small-scale GWs has been a major limitation to numerical climate and weather models for making reliable forecasts. Observations of short-scale features have important implication for validating and improving future high-resolution numerical models. This paper summarizes recent GW observations and sensitivities from several satellite instruments, including MLS, AMSU-A, AIRS, GPS, and CLAES. It is shown in an example that mountain waves with horizontal wavelengths as short as 30 km now can be observed by AIRS, reflecting the superior horizontal resolution in these modern satellite instruments. Our studies show that MLS, AMSU-A and AIRS observations reveal similar GW characteristics, with the observed variances correlated well with background winds. As a complementary technique, limb sounding instruments like CRISTA, CLAES, and GPS can detect GWs with better vertical but poorer horizontal resolutions. To resolve different parts of the broad GW spectrum, both satellite limb and nadir observing techniques are needed, and a better understanding of GW complexities requires joint analyses of these data and dedicated high-resolution model simulations.

Author

Gravity Waves; Satellite Observation; Earth Atmosphere; Atmospheric General Circulation Models; Atmospheric Circulation

20070023726 Colorado State Univ., Fort Collins, CO, USA

Quantifying Global Uncertainties in a Simple Microwave Rainfall Algorithm

Kummerow, Christian; Berg, Wesley; Thomas-Stahle, Jody; Masunaga, Hirohiko; Journal of Atmospheric and Oceanic Technology; January 2006; Volume 23, Issue 1, pp. 23-37; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-13694; NNG04H245G; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1175/JTECH1827.1

While a large number of methods exist in the literature for retrieving rainfall from passive microwave brightness temperatures, little has been written about the quantitative assessment of the expected uncertainties in these rainfall products at various time and space scales. The latter is the result of two factors: sparse validation sites over most of the world's oceans, and algorithm sensitivities to rainfall regimes that cause inconsistencies against validation data collected at different locations. To make progress in this area, a simple probabilistic algorithm is developed. The algorithm uses an a priori database constructed from the Tropical Rainfall Measuring Mission (TRMM) radar data coupled with radiative transfer computations. Unlike efforts designed to improve rainfall products, this algorithm takes a step backward in order to focus on uncertainties. In addition to inversion uncertainties, the construction of the algorithm allows errors resulting from incorrect databases, incomplete databases, and time- and space-varying databases to be examined. These are quantified. Results show that the simple algorithm reduces errors introduced by imperfect knowledge of precipitation radar (PR) rain by a factor of 4 relative to an algorithm that is tuned to the PR rainfall. Database completeness does not introduce any additional uncertainty at the global scale, while climatologically distinct space/time domains add approximately 25% uncertainty that cannot be detected by a radiometer alone. Of this value, 20% is attributed to changes in cloud morphology and microphysics, while 5% is a result of changes in the rain/no-rain thresholds. All but 2%-3% of this variability can be accounted for by considering the implicit assumptions in the algorithm. Additional uncertainties introduced by the details of the algorithm formulation are not quantified in this study because of the need for independent measurements that are beyond the scope of this paper. A validation strategy for these errors is outlined.

Author

Algorithms; Microwaves; Rain; Meteorological Radar

20070023907 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

AIRS Infrared Polarization Sensitivity and In-Flight Observations

Pagano, Thomas S.; Aumann, Hartmut H.; Elliott, Denis; Broberg, Steven E.; August 2, 2005; 8 pp.; In English; SPIE 49th International Symposium on Optical Science and Technology Annual Meeting, 2-4 August 2004, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40132

The Atmospheric Infrared Sounder (AIRS) is a space-based instrument that measures the upwelling atmospheric spectrum in the infrared. AIRS is one of several instruments on the EOS-Aqua spacecraft launched on May 4, 2002: Typically, instrument polarization is not a concern in the infrared because the scene is usually not significantly polarized. A small amount of polarization is expected over ocean, which can be seen in the AIRS 3.7 (micro)m window channels. The polarization is seen as a signal difference between two channels with the same center frequency but different polarizations. The observations are compared to a model that relies on measurements of instrument polarization made pre-flight. A first look at a comparison of the observations of sea surface polarization to expectations is presented.

Author

Satellite-Borne Instruments; Polarization; Sensitivity; Infrared Radiation; Ocean Surface; Atmospheric Sounding

20070023910 Colorado State Univ., Fort Collins, CO, USA

The Effects of Rainfall Inhomogeneity on Climate Variability of Rainfall Estimated from Passive Microwave Sensors

Kummerow, Christian; Poyner, Philip; Berg, Wesley; Thomas-Stahle, Jody; Journal of Atmospheric and Oceanic Technology; April 2007; Volume 21, pp. 624-638; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-13694; NAG5-11189; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1175/1520-0426(2004)021<0624:TEORIO>2.0.CO;2

Passive microwave rainfall estimates that exploit the emission signal of raindrops in the atmosphere are sensitive to the inhomogeneity of rainfall within the satellite field of view (FOV). In particular, the concave nature of the brightness temperature (T(sub b)) versus rainfall relations at frequencies capable of detecting the blackbody emission of raindrops cause retrieval algorithms to systematically underestimate precipitation unless the rainfall is homogeneous within a radiometer FOV, or the inhomogeneity is accounted for explicitly. This problem has a long history in the passive microwave community and

has been termed the beam-filling error. While not a true error, correcting for it requires a priori knowledge about the actual distribution of the rainfall within the satellite FOV, or at least a statistical representation of this inhomogeneity. This study first examines the magnitude of this beam-filling correction when slant-path radiative transfer calculations are used to account for the oblique incidence of current radiometers. Because of the horizontal averaging that occurs away from the nadir direction, the beam-filling error is found to be only a fraction of what has been reported previously in the literature based upon plane-parallel calculations. For a FOV representative of the 19-GHz radiometer channel (18 km X 28 km) aboard the Tropical Rainfall Measuring Mission (TRMM), the mean beam-filling correction computed in this study for tropical atmospheres is 1.26 instead of 1.52 computed from plane-parallel techniques. The slant-path solution is also less sensitive to finescale rainfall inhomogeneity and is, thus, able to make use of 4-km radar data from the TRMM Precipitation Radar (PR) in order to map regional and seasonal distributions of observed rainfall inhomogeneity in the Tropics. The data are examined to assess the expected errors introduced into climate rainfall records by unresolved changes in rainfall inhomogeneity. Results show that global mean monthly errors introduced by not explicitly accounting for rainfall inhomogeneity do not exceed 0.5% if the beam-filling error is allowed to be a function of rainfall rate and freezing level and does not exceed 2% if a universal beam-filling correction is applied that depends only upon the freezing level. Monthly regional errors can be significantly larger. Over the Indian Ocean, errors as large as 8% were found if the beam-filling correction is allowed to vary with rainfall rate and freezing level while errors of 15% were found if a universal correction is used.
Author
Climate; Inhomogeneity; Meteorological Radar; Microwave Sensors; Rain; Meteorological Satellites

20070023935 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
NASA Supercomputer Improves Prospects for Ocean Climate Research
Menemenlis, D.; Hill, C.; Adcroft, A.; Campin, J. -M.; Cheng, B.; Ciotti, B.; Fukumori, I.; Heimbach, P.; Henze, C.; Kohl, A.; Lee, T.; Stammer, D.; Taft, J.; Zhang, J.; Eos, Transactions American Geophysical Union; March 1, 2005; Volume 89, No. 9, pp. 89; In English; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40086; http://dx.doi.org/10.1029/2005EO090002

Estimates of ocean circulation constrained by in situ and remotely sensed observations have become routinely available during the past five years, and they are being applied to myriad scientific and operational problems [Stammer et al.,2002]. Under the Global Ocean Data Assimilation Experiment (GODAE), several regional and global estimates have evolved for applications in climate research, seasonal forecasting, naval operations, marine safety, fisheries,the offshore oil industry, coastal management, and other areas. This article reports on recent progress by one effort, the consortium for Estimating the Circulation and Climate of the Ocean (ECCO), toward a next-generation synthesis of ocean and sea-ice data that is global, that covers the full ocean depth, and that permits eddies.
Author
Oceans; Marine Meteorology; Supercomputers; Climatology; Research; Ocean Currents; Remote Sensing

20070024434 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Remarkable 2003--2004 Winter and Other Recent Warm Winters in the Arctic Stratosphere Since the Late 1990s
Manney, Gloria L.; Kruger, Kirstin; Sabutis, Joseph L.; Sena, Sara Amina; Pawson, Steven; Journal of Geophysical Research; February 25, 2005; ISSN 0148-0227; Volume 110; 14 pp.; In English; Original contains fold-outs or oversized pages that could not be scanned; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40079; http://dx.doi.org/10.1029/2004JD005367

The 2003-2004 Arctic winter was remarkable in the approximately 50-year record of meteorological analyses. A major warming beginning in early January 2004 led to nearly 2 months of vortex disruption with high-latitude easterlies in the middle to lower stratosphere. The upper stratospheric vortex broke up in late December, but began to recover by early January, and in February and March was the strongest since regular observations began in 1979. The lower stratospheric vortex broke up in late January. Comparison with 2 previous years, 1984-1985 and 1986-1987, with prolonged midwinter warming periods shows unique characteristics of the 2003-2004 warming period: The length of the vortex disruption, the strong and rapid recovery in the upper stratosphere, and the slow progression of the warming from upper to lower stratosphere. January 2004 zonal mean winds in the middle and lower stratosphere were over 2 standard deviations below average. Examination of past variability shows that the recent frequency of major stratospheric warmings (7 in the past 6 years) is unprecedented. Lower stratospheric temperatures were unusually high during 6 of the past 7 years, with 5 having much lower than usual potential for polar stratospheric cloud (PSC) formation and ozone loss (nearly none in 1998-1999, 2001-2002, and 2003-2004, and very little in 1997-1998 and 2000-2001). Middle and upper stratospheric temperatures, however, were unusually low during and after February. The pattern of 5 of the last 7 years with very low PSC potential would be expected to occur randomly once

every 850 years. This cluster of warm winters, immediately following a period of unusually cold winters, may have important implications for possible changes in interannual variability and for determination and attribution of trends in stratospheric temperatures and ozone.
Author
Arctic Regions; Stratosphere; Winter; Annual Variations; Warm Fronts; Clouds (Meteorology)

20070024580 Hokkaido Univ., Sapporo, Japan
Low Temperature Science, Volume 65
2006; ISSN 1880-7593; 151 pp.; In Japanese; See also 20070024581 - 20070024596; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Titles in this journal issue include: On the Significance of the Olthotslt Region in Climate Variability; Arctic Oscillation and Climate in Japan; Decadal Variability in the Okhotsk Sea: Sea-ice and Upper Ocean Temperature; Low Frequent Variability of the Siberian High and East Asian Winter Monsoon; Climate Reconstructions from Tree Rings: Current State and Methodology; Reconstruction of Paleo-climate Using Tree-ring Oxygen Isotopic Ratios; Past Climate Reconstruction by Means of Ice Core Analyses Recovered from High-Mountains in the Northern North Pacific; Sea of Okhotsk Sensitive to Global Warming: its Impact on the North Pacific; Climate-change Simulations: Future Climate Projections and Paleo-climate Modeling; Atmospheric Circulation Over East Asia and the North Pacific at the Last Glacial Maximum: Simulation Using a General Circulation Model; Pollen-based Reconstructions of Past Vegetation and Climate; Paleoceanographic Research of Past Sea-ice Variations in the Okhotsk Sea: Evidence from Ice-rafted-debris in Marine Sediment Cores; Rapid Fluctuations in Alkenone Temperature in the Southwestern Olihotsk Sea Over the Past 120 kyr; Pan-Okhotsk Regional Climate Model; Numerical Predictions of Sea Ice and its Application; and Modeling Studies of Circulation in the Sea of Okhotsk and the Subarctic North Pacific.
CASI
Low Temperature Environments; Climate Change; Climate Models

20070024581 Japan Agency for Marine-Earth Science and Technology, Kanagawa, Japan
Rapid Fluctuations in Alkenone Temperature in the Southwestern Okhotsk Sea Over the Past 120 kyr
Harada, Naomi; Sakamoto, Tatsuhiko; Low Temperature Science, Volume 65; 2006, pp. 115-122; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

To better understand the way in which changes in the surface environmental in the Okhotsk Sea influence climate change in East Asia, we estimated sea surface temperatures in the southwestern Okhotsk Sea for the past 120 kyr at millennial to centennial temporal resolution using a long-chain unsaturated alkyl ketone (alkenone) thermometer. The alkenone temperature, which corresponds to the SST to 20 m depth in autumn, showed repeated abrupt changes at a centennial timescale, especially during the last glacial period at 20-60 kyr before present (BP). The alkenone temperature changed in tan dem with changes from interstadials (warm events) to stadials (cold events) recorded in the delta O-18 record of ice cores recovered from Greenland. Anomalously high alkenone temperatures occurred repeatedly during the glacial period. These warm alkenone-temperature episodes probably had multiple causes: (1) the main season of alkenone production may have shifted from autumn to midsummer over the course of the glacial period because of the expansion of sea-ice coverage to nearly all seasons except midsummer; (2) related to the expansion of the sea-ice season, the sea-ice melting season may have shifted from spring to summer and sea-ice melting during summer might have led to stratification of the surface water, resulting in a high SST; and (3) an active Asian summer monsoon may have contributed to warming the surface waters of the southwestern Okhotsk Sea. In combination, these effects could have generated anomalously high alkenone temperatures in the southwestern Okhotsk Sea during the examined glacial period.
Author
Alkyl Compounds; Sea of Okhotsk; Ketones; Climate Change; Sea Surface Temperature

20070024582 Hokkaido Univ., Sapporo, Japan
Sea of Okhotsk Sensitive to Global Warming: its Impact on the North Pacific
Ohshima, Kay I.; Nakanowatari, Takuya; Wakatsuchi, Masaaki; Low Temperature Science, Volume 65; 2006, pp. 67-75; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

High sea ice production over the northwestern shelf in the Sea of Okhotsk leads to the formation of the densest water at the surface in the North Pacific. This cold dense shelf water is ventilated into the intermediate layer, inducing overturning at the scale of the North Pacific. During the past 50 years, warming and weakening of the overturning has occurred for the

intermediate water centered on the 27.0 sigma theta is isopycnal in the northwestern North Pacific, originating from the Sea of Okhotsk. We propose that these trends are caused by a decrease in dense shelf water production in the northwestern shelf of the Sea of Okhotsk, which is an area that is sensitive to current global warming. The weakening of overturning has a possibility of substantial impacts on the material cycle and biological productivity in the North Pacific.
Author
Global Warming; Sea of Okhotsk; Sensitivity; Pacific Ocean

20070024583 Tokyo Univ., Japan
Atmospheric Circulation Over East Asia and the North Pacific at the Last Glacial Maximum: Simulation Using a General Circulation Model
Yanase, Wataru; Abe-Ouchi, Ayako; Low Temperature Science, Volume 65; 2006, pp. 87-96; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

General circulation models have been used to simulate the atmosphere at the last glacial maximum, the age of largescale ice-sheets, and reduced CO2 content. In the present study, we focus on atmospheric circulation over East Asia and the North Pacific. The coupled atmosphere-ocean model reproduces a number of characteristics that are consistent with geological records, including the dry signal over East Asia and the southward shift of the upperlevel westerly jet. A number of different models produced consistent changes in circulation over the North Pacific. Sensitivity experiments reveal that the albedo effect of the ice sheet over North America has a significant influence on atmospheric circulation over the North Pacific.
Author
Asia; Atmospheric General Circulation Models; Glaciers; Simulation; Pacific Ocean

20070024584 Japan Marine Science and Technology Center, Japan
Paleoceanographic Research of Past Sea-ice Variations in the Okhotsk Sea: Evidence from Ice-rafted-debris in Marine Sediment Cores
Sakamoto, Tatsuhiko; Low Temperature Science, Volume 65; 2006, pp. 103-114; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

Ice-rafted debris (IRD) from sediment traps, surfical sediments, and sediment cores were investigated to reconstruct the extent of sea-ice cover in the Okhotsk Sea over the past 100 kyr. Seasonal IRD buried within the sediments during and after the melting of sea-ice in the spring consists of silt- and sand-sized terrigenous particles. The spatial distribution of IRD within surficial sediments clearly corresponds to the average state of extent of sea-ice coverage. Sea ice expanded to a maximum extent during glacial periods, although the cover of sea ice was not perennial. Okhotsk Sea Sea-ice Expansion (OSIE) events, which are as abrupt millennial-scale peaks in IRD content, have occurred 13 times during the past 100 kyrs. These events were amplified in magnitude during glacial periods. The significant modification of polar atmospheric circulation in the northern hemisphere is a key process in explaining these OSIE events.
Author
Sea Ice; Sea of Okhotsk; Annual Variations; Debris; Oceanography; Sediments

20070024585 Hokkaido Univ., Sapporo, Japan
Reconstruction of Paleo-climate Using Tree-ring Oxygen Isotopic Ratios
Nakatsuka, Takeshi; Low Temperature Science, Volume 65; 2006, pp. 49-56; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

The recent development of improved analytical methods means that oxygen isotopic ratios of tree-ring cellulose is now a new powerful tool in reconstructing past changes in climate. The oxygen isotopic ratio of tree rings is not affected by physio-ecological factors: it reflects only the precipitation isotopic ratio and relative humidity. Consequently, it is applicable in the reconstruction of the past water cycle, even in regions such as Japan where competition for light among densely populated trees maltes it difficult to utilize tree-ring width or carbon isotopic ratios for climatic analyses. Moreover, recent progress in the analysis of the intra-ring oxygen isotopic ratio will soon enable the extraction of information regarding past seasonal changes in climate.
Author
Oxygen Isotopes; Isotope Ratios; Paleoclimatology; Trees (Plants)

20070024586 Hokkaido Univ., Sapporo, Japan

Decadal Variability in the Okhotsk Sea: Sea-ice and Upper Ocean Temperature

Sasaki, Yoshi Nori; Minobe, Shoshiro; Low Temperature Science, Volume 65; 2006, pp. 21-30; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

We investigate decadal-scale variations in the wintertime (February-March) sea-ice concentration and warm-season (May-October) water temperature in the upper 200m of the Okhotsk Sea, as well as their relation to atmospheric circulation. Large decadal-scale variation in wintertime sea-ice occurs in the northern Okhotsk Sea; this variability showed a decreasing trend from 1980 to the mid-1990s and an increasing trend from the mid-1990s to the early 2000s. This sea-ice variation is thermodynamically influenced by the atmospheric conditions during the late autumn (October-November). The atmospheric conditions in late autumn for the positive sea-ice anomalies exhibit cold air-temperature anomalies over the Okhotsk Sea and wind anomalies blowing into the Okhotsk Sea from Siberia. These atmospheric conditions in late autumn are related to 700-hPa geopotential height differences between the Bering Sea and northern Eurasia. The dominant upper-ocean temperature fluctuations in the southern Okhotsk Sea have a monopole structure with the maximum amplitude in the Kuril Basin; corresponding time series exhibit prominent quasi-decadal variability over the period 1958-94. This variability is closely related to wintertime differences in sea-level pressure between northern Eurasia and the northern North Pacific.

Author

Ocean Temperature; Sea of Okhotsk; Annual Variations; Seasons; Atmospheric Circulation

20070024587 Japan Marine Science and Technology Center, Tokyo, Japan

Low Frequent Variability of the Siberian High and East Asian Winter Monsoon

Takaya, Koutarou; Nakamura, Hisashi; Low Temperature Science, Volume 65; 2006, pp. 31-42; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

The Siberian high is a cold, semi-permanent surface anticyclone residing over the Asian continent in winter. The high is known as one of the crucial factors for wintertime climate over the Far East and Northwestern Pacific, as it influences the strength of the East Asian winter monsoon. Intraseasonal amplification events of the surface Siberian high in winter are generally associated with blocking ridge formation in the upper troposphere. Composite analysis applied to the 20 strongest intraseasonal events over Siberia on the basis of the circulation data observed over the 40 recent years reveals that the blocking formation differs fundamentally between the east and west of the climatological upper-level trough over the Far East. To the west, what may be called 'wave-train (Atlantic-origin) type' is common, while what may be called 'Pacific-origin type' dominates to the east of the trough. Regardless of a particular type of blocking formation in the upper troposphere, a cold-air outbreak tends to occur once anomalously cold air reaches the northeastern slope of the Tibetan Plateau. We have shown through 'potential vorticity (PV) inversion' technique that an interaction of the upper-level height anomalies with surface temperature anomalies is essential for amplification of the Siberian high of the both types. Interannual variability of the East Asian winter monsoon has also been examined. Two distinct height anomaly patterns in the upper troposphere associated with the interannual variability are found; that is, wavetrain pattern and WP-like patterns. Both types can be interpreted as modulations of activities of planetary waves. The difference of the planetary wave formation from early winter to midwinter is apparent between cold and warm winter in the mid-latitude East Asia.

Author

Asia; Monsoons; Siberia; Winter; Climatology; Annual Variations; Anticyclones

20070024588 Meteorological Research Inst., Japan

Climate-change Simulations: Future Climate Projections and Paleo-climate Modeling

Kitoh, Akio; Low Temperature Science, Volume 65; 2006, pp. 77-85; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

Coupled atmosphere-ocean general circulation models (AOGCMs) call be used for future climate projections and paleoclimate simulations. AOGCMs that are currently used for climate simulations reproduce the major characteristic features of the present atmosphere and ocean climate; however, they tend to show a diffuse thermocline and a weaker salinity contrast between the ocean basins. We present selected AOGCM results of future climate projections for the end of the 21st century. We also show an example of paleoclimate simulations for the Mid-Holocene (6,000 years before the present). The results reveal robust features such as an enhanced winter-to-summer seasonal change and enhanced monsoons, responding to the prescribed orbital forcing.

Author

Climate Change; Simulation; Paleoclimatology; Atmospheric General Circulation Models; Annual Variations

20070024589 Ehime Univ., Matsuyama, Japan

Climate Reconstructions from Tree Rings: Current State and Methodology

Kobayashi, Osamu; Low Temperature Science, Volume 65; 2006, pp. 43-48; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

Tree rings possess high potential to reconstruct past climate in both temporal and spatial scale compared to any other climate proxies. During the past 100 years, developments in dendroclimatology enhanced our understanding in past climate in many parts of the world. Dendroclimatology has been applied to various tree species growing in different site conditions. Ring width, density, wood anatomical features and isotopes derived from tree rings are now used as climate proxies. In this report, the current state of dendroclimatology and the strengths and weaknesses are explained. The potential of dendroclimatological research within the pan-Okhotsk region is discussed.

Author

Climatology; Dendrochronology; Sea of Okhotsk; Methodology

20070024590 Japan Marine Science and Technology Center, Tokyo, Japan

On the Significance of the Okhotsk Region in Climate Variability

Nakamura, Hisashi; Honda, Meiji; Takaya, Koutarou; Low Temperature Science, Volume 65; 2006, pp. 12-19; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

The Sea of Okhotsk is a shallow mid-latitude marginal sea bordered by the Asian Continent to its west and north. A strong thermal contrast forms in summer between the cool sea surface and the heated landmass, while the thermal gradient is reversed in winter. Under the influence of the continuous spill of extremely cold air from the continent and fresh water supplied by the Amur River, the Okhotsk region becomes the southernmost ice-covered maritime region in the Northern Hemisphere. With regard to how these seasonal characteristics of the surface thermal condition and their interannual variability in and around the Okhotsk region can be related to the variability in hemispheric-scale atmospheric circulation, we discuss the possible influence of the anomalous sea-ice extent on large-scale atmospheric circulation and the formation of the summertime cool surface Okhotsk High, based on data analysis and numerical experiments.

Author

Climate; Sea of Okhotsk; Temperate Regions; Annual Variations; Atmospheric Circulation

20070024592 Hokkaido Univ., Sapporo, Japan

Pan-Okhotsk Regional Climate Model

Nakamura, Tomohiro; Mitsudera, Humio; Low Temperature Science, Volume 65; 2006, pp. 123-130; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

The pan-Okhotsk region has a characteristic climate that is changing rapidly due to global warming. The pan-Okhotsk Regional Climate Model is being constructed at the Pan-Okhotsk Research Center within the Institute of Low Temperature Science, Hokkaido University, to gain a better understanding and improved prediction of the formation process and change in: (1) the climate in the Pan-Okhotsk region, and (2) three-dimensional circulations of nutrients and their interaction with the ecosystem in the region. This article describes the model and presents preliminary results.

Author

Climate Models; Global Warming; Ecosystems; Regions; Sea of Okhotsk

20070024594 Hokkaido Univ., Sapporo, Japan

Past Climate Reconstruction by Means of Ice Core Analyses Recovered from High-Mountains in the Northern North Pacific

Shiraiwa, Takayuki; Low Temperature Science, Volume 65; 2006, pp. 57-65; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

Three independent ice cores were recently drilled at Ushkovsky Volcano in Kamchatka, Russia, Mount Wrangell in Alaska, and Mount Logan King Col in Canada. Detailed analyses of the temperature and density profiles of the three cores suggest that the three sampled glaciers are cold glaciers and therefore store reliable paleo-climate information that spans the past several hundreds to a thousand years. A negative relation was found for the net accumulation time-series reconstructed for the past 170 years from the ice cores recovered from Ushkovsky Volcano and Mount Logan. As the oscillations in the net accumulation rate and the average annual delta(18)O reconstructed from the Ushkovsky ice core appear to be closely correlated with the so-called Pacific Decadal Oscillation (PDO) Index, it was suggested that the mass balances of the glaciers

on both sides of the northern North Pacific were affected not only by a global warming trend since the Little Ice Age but also by inter-decadal climate variability that had occured dominantly over the North Pacific.
Author
Glaciers; Core Sampling; Periodic Variations; Land Ice; Temperature Profiles; Density Distribution; Paleoclimatology

20070024595 Hokkaido Univ., Sapporo, Japan
Arctic Oscillation and Climate in Japan
Yamazaki, Koji; Low Temperature Science, Volume 65; 2006, pp. 13-19; In English; See also 20070024580; Copyright; Avail.: Other Sources

We review the Arctic Oscillation, which is the dominant mode of variability in atmospheric circulation in the Northern Hemisphere, along with it's structure, relation to the stratosphere, origin, seasonal variation, and relation to climate in Japan. The Arctic Oscillation is an oscillation in sea-level pressure between the Arctic and the mid-latitudes: it is associated with variation in the high-latitude jet. In winter, the Arctic Oscillation extends well into the stratosphere and its structure is quasi-barotropic. In a positive phase of the Arctic Oscillation, Japan, and, northern Japan in particular, tends to experience warm winter. In summer, a positive phase of the Arctic Oscillation is associated with the enhanced Okhotsk high.
Author
Arctic Regions; Atmospheric Circulation; Climate; Japan; Oscillations; Sea of Okhotsk

20070024596 Kyoto Prefectural Univ., Kyoto, Japan
Pollen-based Reconstructions of Past Vegetation and Climate
Takahara, Hikaru; Low Temperature Science, Volume 65; 2006, pp. 102-113; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

This paper reviews recent progress in the use of pollen data in reconstructing past vegetation and climate. The models developed by Prentice and Sugita, which can define the spatial scale of vegetation represented by the fossil pollen, can be applied to studies of forest dynamics. Also, the biomization method is used to reconstruct biomes from pollen data using a biome model. Finally, pollen-based climate reconstruction method using modern analogues for the relationship between climate data and pollen data obtained from surface samples are reviewed.
Author
Climate; Ecosystems; Pollen; Vegetation

20070024882 Government Accountability Office, Washington, DC, USA
Climate Change: Financial Risks to Federal and Private Insurers in Coming Decades Are Potentially Significant
Mar. 2007; 74 pp.; In English
Report No.(s): PB2007-108715; GAO-07-285; No Copyright; Avail.: CASI: A04, Hardcopy

Weather-related events have cost the nation billions of dollars in damages over the past decade. Many of these losses are borne by private insurers and by two federal insurance programs--the National Flood Insurance Program (NFIP), which insures properties against flooding, and the Federal Crop Insurance Corporation (FCIC), which insures crops against drought or other weather disasters. GAO was asked to (1) describe how climate change may affect future weather-related losses, (2) determine past insured weather-related losses, and (3) determine what major private insurers and federal insurers are doing to prepare for potential increases in such losses. In response, among other things, GAO reviewed key scientific assessments; analyzed insured loss data; and contacted private insurers, NFIP, and FCIC.
NTIS
Climate; Climate Change; Disasters; Insurance (Contracts); Risk

20070024919 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Satellite Applications for Military Support: Trendwatch from an EO Perspective
Schoemaker, R. M.; March 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.35241
Report No.(s): TNO-DV 2006 A450; TD2006-0140; Copyright; Avail.: Other Sources

A safe, effective and efficient realization is what counts during expeditionary tasks of the Netherlands forces in remote regions in the world. These regions are mostly coastal areas and desolate mountainous terrain in the Middle East and Africa. The current weather and atmospheric conditions for these regions often bring unverifiable and unpredictable factors that influence tactical and strategically decisions in a negative manner. Many natural and artificial conditions can be named that

can hamper operations. A fast assessment of the environmental conditions by the right information then is required. Satellite remote sensing data can be of assistance if in situ data is not present in these desolate regions.
Author
Meteorology; Satellite Imagery; Satellite Observation

20070024936 Geological Survey, Reston, VA USA
Spatial Landscape Model of Forest Patch Dynamics and Climate Change
Busing, R. T.; January 2007; 50 pp.; In English
Report No.(s): PB2007-108574; USGS-SRI-2007-5040; No Copyright; Avail.: National Technical Information Service (NTIS)

FOREL (a FOREst Landscape model) is an individual-based, multi-scale simulator of forest and climate dynamics. Rationale and design of the model are presented in relation to other forest patch models. Information on implementation of the model is also provided. Capabilities of the FOREL model are demonstrated for forest composition, structure and dynamics along climatic gradients. The model relies on a patch simulation approach that has been tested and developed by independent ecologists for more than three decades. Improvements made over the last decade to the simulation of climate effects on trees are incorporated in the landscape model. A single parameterization of the model is capable of simulating major shifts in forest composition and structure across broad climatic gradients. It is responsive along moisture gradients and temperature gradients. The landscape model is flexible and can be altered easily to test various assumptions about the effects of climate on trees, and the effects of spatial pattern on processes operating within and among forest stands. The spatial structure of the model makes interaction of patches possible. Interactions may include dispersal of propagules and competition for light. The model is a useful tool for projecting temporal climate change effects on forested sites, landscapes and regions.
NTIS
Climate Change; Forests; Terrain; Topography; Models

20070024983 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Coupling TOUGH2 with CLM3: Developing a Coupled Land Surface and Subsurface Model
Pan, L.; Jin, J.; Miller, N.; Wu, Y. S.; Bodvarsson, G.; May 2006; 6 pp.; In English
Report No.(s): DE2007-899189; No Copyright; Avail.: National Technical Information Service (NTIS)

An understanding of the hydrologic interactions among atmosphere, land surface, and subsurface is one of the keys to understanding the water cycling system that supports life on earth. The inherent coupled processes and complex feedback structures among subsystems make such interactions difficult to simulate. In this paper, we present a model that simulates the land surface and subsurface hydrologic response to meteorological forcing. This model combines a state-of-the-art land-surface model, the NCAR Community Land Model version 3 (CLM3), with a variably saturated groundwater model, TOUGH2, through an internal interface that includes flux and state variables shared by the two submodels. Specifically, TOUGH2 uses infiltration, evaporation, and root-uptake rates, calculated by CLM3, as source/sink terms in its simulation; CLM3 uses saturation and capillary pressure profiles, calculated by TOUGH2, as state variables in its simulation. This new model, CLMT2, preserves the best aspects of both submodels: the state-of-the-art modeling capability of surface energy and hydrologic processes (including snow, runoff, freezing/melting, evapotranspiration, radiation, and biophysiological processes) from CLM3 and the more realistic physical-process-based modeling capability of subsurface hydrologic processes (including heterogeneity, three-dimensional flow, seamless combining of unsaturated and saturated zone, and water table) from TOUGH2. The preliminary simulation results show that the coupled model greatly improved the predictions of the groundwater table, evapotranspiration, and surface temperature at a real watershed, as evaluated using 18 years of observed data. The new model is also ready to be coupled with an atmospheric simulation model, to form one of the first top of the atmosphere to deep groundwater atmosphere-land-surface-subsurface models.
NTIS
Earth Surface; Hydrology

20070025102 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Sensitivity of Ozone to Bromine in the Lower Stratosphere
Salawitch, R. J.; Weisenstein, D. K.; Kovalenko, L. J.; Sioris, C. E.; Wennberg, P. O.; Chance, K.; Ko, M. K. W.; McLinden, C. A.; Geophysical Research Letters, 2005; March 9, 2005; ISSN 0094-8276; Volume 32; 5 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40044; http://dx.doi.org/10.1029/2004GL021504

Measurements of BrO suggest that inorganic bromine (Br(sub y)) at and above the tropopause is 4 to 8 ppt greater than

assumed in models used in past ozone trend assessment studies. This additional bromine is likely carried to the stratosphere by short-lived biogenic compounds and their decomposition products, including tropospheric BrO. Including this additional bromine in an ozone trend simulation increases the computed ozone depletion over the past approx.25 years, leading to better agreement between measured and modeled ozone trends. This additional Br(sub y) (assumed constant over time) causes more ozone depletion because associated BrO provides a reaction partner for ClO, which increases due to anthropogenic sources. Enhanced Br(sub y) causes photochemical loss of ozone below approx.14 km to change from being controlled by HO(sub x) catalytic cycles (primarily HO2+O3) to a situation where loss by the BrO+HO2 cycle is also important.
Author
Photochemical Reactions; Stratosphere; Ozone Depletion; Bromine; Hydrogen Compounds

20070025103 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA
Simulations of Dynamics and Transport during the September 2002 Antarctic Major Warming
Manney, Gloria L.; Sabutis, Joseph L.; Allen, Douglas R.; Lahoz, Willian A.; Scaife, Adam A.; Randall, Cora E.; Pawson, Steven; Naujokat, Barbara; Swinbank, Richard; Journal of Atmospheric Sciences; March 2005; Volume 62, Issue 3, pp. 690-707; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40043

A mechanistic model simulation initialized on 14 September 2002, forced by 100-hPa geopotential heights from Met Office analyses, reproduced the dynamical features of the 2002 Antarctic major warming. The vortex split on approx.25 September; recovery after the warming, westward and equatorward tilting vortices, and strong baroclinic zones in temperature associated with a dipole pattern of upward and downward vertical velocities were all captured in the simulation. Model results and analyses show a pattern of strong upward wave propagation throughout the warming, with zonal wind deceleration throughout the stratosphere at high latitudes before the vortex split, continuing in the middle and upper stratosphere and spreading to lower latitudes after the split. Three-dimensional Eliassen-Palm fluxes show the largest upward and poleward wave propagation in the 0(deg)-90(deg)E sector prior to the vortex split (coincident with the location of strongest cyclogenesis at the model's lower boundary), with an additional region of strong upward propagation developing near 180(deg)-270(deg)E. These characteristics are similar to those of Arctic wave-2 major warmings, except that during this warming, the vortex did not split below approx.600 K. The effects of poleward transport and mixing dominate modeled trace gas evolution through most of the mid- to high-latitude stratosphere, with a core region in the lower-stratospheric vortex where enhanced descent dominates and the vortex remains isolated. Strongly tilted vortices led to low-latitude air overlying vortex air, resulting in highly unusual trace gas profiles. Simulations driven with several meteorological datasets reproduced the major warming, but in others, stronger latitudinal gradients at high latitudes at the model boundary resulted in simulations without a complete vortex split in the midstratosphere. Numerous tests indicate very high sensitivity to the boundary fields, especially the wave-2 amplitude. Major warmings occurred for initial fields with stronger winds and larger vortices, but not smaller vortices, consistent with the initiation of wind-deceleration by upward-propagating waves near the poleward edge of the region where wave 2 can propagate above the jet core. Thus, given the observed 100-hPa boundary forcing, stratospheric preconditioning is not needed to reproduce a major warming similar to that observed. The anomalously strong forcing in the lower stratosphere can be viewed as the primary direct cause of the major warming.
Author
Antarctic Regions; Atmospheric Composition; Vortices; Trace Contaminants; Wave Propagation; Atmospheric Heating; Stratosphere

20070025105 NASA Langley Research Center, Hampton, VA, USA
Sensitivity of Global Modeling Initiative Model Predictions of Antarctic Ozone Recovery to Input Meteorological Fields
Considine, David B.; Connell, Peter S.; Bergmann, Daniel J.; Rotman, Douglas A.; Strahan, Susan E.; Journal of Geophysical Research; August 03, 2004; Volume 109, D15301; 14 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): DOE-W-7405-ENG-48; NAG5-10725; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2003JD004487

We use the Global Modeling Initiative chemistry and transport model to simulate the evolution of stratospheric ozone between 1995 and 2030, using boundary conditions consistent with the recent World Meteorological Organization ozone assessment. We compare the Antarctic ozone recovery predictions of two simulations, one driven by an annually repeated year of meteorological data from a general circulation model (GCM), the other using a year of output from a data assimilation system (DAS), to examine the sensitivity of Antarctic ozone recovery predictions to the characteristic dynamical differences between GCM- and DAS-generated meteorological data. Although the age of air in the Antarctic lower stratosphere differs by

a factor of 2 between the simulations, we find little sensitivity of the 1995-2030 Antarctic ozone recovery between 350 and 650 K to the differing meteorological fields, particularly when the recovery is specified in mixing ratio units. Percent changes are smaller in the DAS-driven simulation compared to the GCM-driven simulation because of a surplus of Antarctic ozone in the DAS-driven simulation which is not consistent with observations. The peak ozone change between 1995 and 2030 in both simulations is approx.20% lower than photochemical expectations, indicating that changes in ozone transport due to changing ozone gradients at 450 K between 1995 and 2030 constitute a small negative feedback. Total winter/spring ozone loss during the base year (1995) of both simulations and the rate of ozone loss during August and September is somewhat weaker than observed. This appears to be due to underestimates of Antarctic Cl(sub y) at the 450 K potential temperature level. Author

Meteorological Parameters; Photochemical Reactions; Atmospheric Composition; Assimilation; Ozone; Simulation; Atmospheric General Circulation Models; Boundary Conditions

20070025106 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Radicals and Reservoirs in the GMI Chemistry and Transport Model: Comparison to Measurements

Douglass, Anne R.; Stolarski, Richard S.; Strahan, Susan E.; Connell, Peter S.; Journal of Geophysical Research; August 17, 2004; Volume 109, D16302; 20 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): DOE-W-7405-Eng-48; NAG5-10725; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2004JD004632

We have used a three-dimensional chemistry and transport model (CTM), developed under the Global Modeling Initiative (GMI), to carry out two simulations of the composition of the stratosphere under changing halogen loading for 1995 through 2030. The two simulations differ only in that one uses meteorological fields from a general circulation model while the other uses meteorological fields from a data assimilation system. A single year's winds and temperatures are repeated for each 36-year simulation. We compare results from these two simulations with an extensive collection of data from satellite and ground-based measurements for 1993-2000. Comparisons of simulated fields with observations of radical and reservoir species for some of the major ozone-destroying compounds are of similar quality for both simulations. Differences in the upper stratosphere, caused by transport of total reactive nitrogen and methane, impact the balance among the ozone loss processes and the sensitivity of the two simulations to the change in composition.

Author

Atmospheric Composition; Ozone; Three Dimensional Models; Stratosphere; Halogens; Meteorological Parameters; Reservoirs; Radicals

20070025113 NASA Ames Research Center, Moffett Field, CA, USA

Formation of a Tropopause Cirrus Layer Observed over Florida during CRYSTAL-FACE

Jensen, Eric; Pfister, Leonhard; Bui, Thaopaul; Weinheimer, Andrew; Weinstock, Elliot; Smith, Jessica; Pittman, Jasna; Baumgardner, Darrel; Lawson, Paul; McGill, Matthew J.; Journal of Geophysical Research; February 15, 2005; Volume 110, D03208; 17 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNA04CC40A; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1029/2004JD004671

On July 13, 2002 a widespread, subvisible tropopause cirrus layer occurred over the Florida region. This cloud was observed in great detail with the NASA Cirrus Regional Study of Tropical Anvils and Cirrus Layers-Florida Area Cirrus Experiment (CRYSTAL-FACE) instrumentation, including in situ measurements with the WB-57 aircraft. In this paper, we use the 13 July cloud as a case study to evaluate the physical processes controlling the formation and evolution of tropopause cirrus layers. Microphysics measurements indicate that ice crystal diameters in the cloud layer ranged from about 7 to 50 microns, and the peak number mode was about 10-25 microns. In situ water vapor and temperature measurements in the cloud indicated supersaturation with respect to ice throughout, with ice saturation ratios as large as 1.8. Even when the ice surface area density was as high as about 500 sq microns/cu cm, ice supersaturations of 20-30% were observed. Trajectory analysis shows that the air sampled near the tropopause on this day generally came from the north and cooled considerably during the previous few days. Examination of infrared satellite imagery along air parcel back trajectories from the WB-57 flight track indicates that the tropopause cloud layer formation was, in general, not simply left over ice from recently generated anvil cirrus. Simulations of cloud formation using time-height curtains of temperature along the trajectory paths show that the cloud could have formed in situ near the tropopause as the air was advected into the south Florida region and cooled to unusually low temperatures. If we assume a high threshold for ice nucleation via homogeneous freezing of aqueous sulfate aerosols, the model reproduces the observed cloud structure, ice crystal size distributions, and ice supersaturation statistics. Inclusion of observed gravity wave temperature perturbations in the simulations is essential to reproduce the observed cloud properties.

Without waves, crystal number densities are too low, crystal sizes are too large, and the crystals fall out too fast, leaving very little cloud persisting at the end of the simulations. In the cloud simulations, coincidence of high supersaturations and high surface areas can be produced by either recent nucleation or sedimentation of crystals into supersaturated layers. The agreement between model results and observed supersaturations is improved somewhat if we assume that the steady state relative humidity within cirrus at T<200 K is enhanced by about 30%. The WB-57 measurements and the model results suggest that the cloud layer irreversibly dehydrated air near the tropopause.
Author
Cloud Cover; Cloud Physics; Tropopause; Trajectory Analysis; Water Vapor; Time Temperature Parameter; Size Distribution; Nucleation; Ice

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20070024591 Hokkaido Univ., Sapporo, Japan
Modeling Studies of Circulation in the Sea of Okhotsk and the Subarctic North Pacific
Mitsudera, Humio; Nakamura, Tomohiro; Low Temperature Science, Volume 65; 2006, pp. 139-148; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

One of characteristics of the ocean circulation system in the Sea of Okhotsk and subarctic North Pacific is the co-existence of wind-driven circulation and thermohaline circulation, exhibiting complicated three-dimensional structures in which the surface- and intermediate-layer motions are coupled via various processes. In this article, we review modeling studies of processes that drive the three-dimensional overturning circulation that spans the surface and intermediate layers.
Author
Ocean Currents; Sea of Okhotsk; Thermohaline Circulation; Ocean Dynamics

20070024593 Hokkaido Univ., Sapporo, Japan
Rapid Fluctuations of Sea Ice and its Application
Kawaguchi, Yusuke; Ikeda, Motoyoshi; Low Temperature Science, Volume 65; 2006, pp. 115-122; In Japanese; See also 20070024580; Copyright; Avail.: Other Sources

Key characteristics of sea ice such as growth, decay, movement, and deformation interact in a complex way to influence polar climate. Accordingly, thermodynamic and dynamic models have been developed separately. Sea ice has been modeled as a continuum medium, as well as the atmosphere and ocean have, because of the ease of treatment given this assumption; however, in some experiments sea ice is regarded as a collection of ice floes and thereby modeled using Lagrangian methods and a number of particles. Here, we introduce an outline of sea-ice modeling and consider ail application of such modeling to the Sea of Okhotsk, which has a seasonal sea ice extent and is the most familiar ocean in terms of this type of research.
Author
Mathematical Models; Sea Ice; Sea of Okhotsk; Dynamic Models

20070024892 National Telecommunications and Information Administration, Washington, DC USA
Lower Mississippi River VTS (Vessel Traffic Service) Frequency Survey
Sole, R. L.; Bedford, B.; Jun. 1999; 54 pp.; In English
Report No.(s): PB2007-108531; NTIA-99-364; No Copyright; Avail.: National Technical Information Service (NTIS)

The maritime mobile frequency band supports maritime communications worldwide. Appendix 18 of the ITU Radio Regulations (RR) defines the channels of the maritime mobile service. These channels support a variety of communication functions including: public correspondence, intership and ship-to-coast, coast- to-ship, port operations, calling and various safety purposes. Safety functions include distress, search and rescue, ship movement, navigation (bridge-to-bridge) communications, and maritime safety information broadcasts. One type of service that can enhance these functions is called a Vessel Traffic Service (VTS). The VTS will enable ships and shore stations to automatically transmit and receive information between themselves in coastal and port areas and inland waterways. Ships will also be able to automatically exchange

information on the high seas. The ships and shore stations will be able to exchange data on ship size, speed, location, heading, cargo and other pertinent information, such as navigation hazards and pollution spills.
NTIS
Frequencies; Mississippi River (US); Surveys; Traffic; Water

20070025099 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
ICESat Observations of Arctic Sea Ice: A First Look
Kwok, Ron; Zwally, H. Jay; Yi, Donghui; Geophysical Research Letter; August 18, 2004; ISSN 0094-8276; Volume 31; 5 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40045; http://dx.doi.org/10.1029/2004GL020309

Analysis of near-coincident ICESat and RADARSAT imagery shows that the retrieved elevations from the laser altimeter are sensitive to new openings (containing thin ice or open water) in the sea ice cover as well as to surface relief of old and first-year ice. The precision of the elevation estimates, measured over relatively flat sea ice, is approx. 2 cm. Using the thickness of thin-ice in recent openings to estimate sea level references, we obtain the sea-ice freeboard along the altimeter tracks. This step is necessitated by the large uncertainties in the sea surface topography compared to that required for accurate determination of freeboard. Unknown snow depth introduces the largest uncertainty in the conversion of freeboard to ice thickness. Surface roughness is also derived, for the first time, from the variability of successive elevation estimates along the altimeter track. Overall, these ICESat measurements provide an unprecedented view of the Arctic Ocean ice cover at length scales at and above the spatial dimension of the altimeter footprint of approx. 70 m.
Author
Arctic Ocean; Ice, Cloud and Land Elevation Satellite; Sea Ice; Imagery; RADARSAT; Ocean Surface

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*.

20070023758 Rice Univ., Houston, TX USA
Seamless Integration of Detection and Therapy for Breast Cancer using Targeted Engineered Nanoparticles
Halas, Naomi J; Jun 2006; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0384
Report No.(s): AD-A465826; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465826

This report summarizes the efforts of our team consisting of researchers from Rice University and M. D. Anderson Cancer Center, in the DoD funded CDMRP award towards the development of an integrated nano particle based imaging and therapy of breast cancer. We have used both gold nano particles (Au-NPs) and gold nanoshells for specifically targeting cancer cells. This has been accomplished in two ways. First by attaching anti-human epidermal growth factor receptor 2 (anti-HER 2) antibodies to gold nanoshells for targeting HER 2 expressing SK-BR3 breast carcinoma cells. The second approach is by building biologically active networks of Au-NP and bacteriophages which can be used as in vivo biological sensors for non invasive optical molecular fingerprinting, and cell targeting agents.
DTIC
Breast; Cancer; Mammary Glands; Nanoparticles; Target Acquisition; Therapy

20070023760 Pennsylvania Univ., Philadelphia, PA USA
Adhesion-Linked Protein Tyrosine Phosphatases, Morphogenesis and Breast Cancer Progression
Weaver, Valerie M; Jul 2006; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-C-0496
Report No.(s): AD-A465841; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465841

Stromal-epithelial interactions regulate breast cell fate via integrin-growth factor receptor (GFR) interactions that activate tyrosine kinases that are tempered by protein tyrosine phosphatases (PTP). Using a series of molecular screening approaches we profiled PTP expression in normal transformed and phenotypically-reverted breast tissue and identified the Band 4.1 PTPs

MEGI and D1 as candidate PTP metastasis suppressors. Our studies have implicated two Band 4.1 PTPs MEGI and D1 as important regulators of adhesion-dependent mammary morphogenesis that are consistently altered in tumors by aberrant tumor-generated mechanical force. Specifically we implicated PTP MEGI as a key regulator of adherens junction assembly/integrity and found that matrix force and tumor-generated contractility chronically increase PTP expression. Importantly ectopic elevated expression of MEGI in nonmalignant MECs enhanced their integrin-dependent cell adhesion disrupted tissue polarity and altered cell growth and survival. Studies are in progress to identify MEGI- specific effector proteins in normal transformed and phenotypically-reverted MECs and to dissect out the mechanism whereby force regulates PTP expression.
DTIC
Adhesion; Breast; Cancer; Mammary Glands; Proteins; Tyrosine

20070023761 California Univ., Berkeley, CA USA
Identification of the Molecular Determinants of Breast Epithelial Cell Polarity
Itoh, Masahiko; Oct 2006; 23 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0742
Report No.(s): AD-A465842; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465842

Maintenance of apico-basal polarity in normal breast epithelial acini requires a balance between cell proliferation and cell death and proper cell-cell and cell-extracelluar matrix signaling. Aberrant regulation of any of these processes can disrupt tissue architecture and initiate tumor formation. We found that the small GTPase Rap 1 is a crucial effector in the organization of acinar structure and the induction of lumen formation. Rapi activity in malignant HMT-3522 T4-2 cells is appreciably higher than in their non-malignant couterparts, S1. Expression of dominant-negative Rap 1 in T4-2 cells resulted in phenotypic reversion, that is, formation of acinar structures with correct apico-basal polarity, and dramatically reduced tumor incidence despite the persistence of genomic abnormalities. The Rap 1 revertants also featured prominent central lumena not observed when other reverting agents are used. Conversely, expression of dominant-active RapI in T4-2 cells inhibited phenotypic reversion and led to increased invasiveness. Thus, RapI acts as a central regulator of breast architecture, and instructs polarity during acinar morphogenesis.
DTIC
Breast; Cancer; Determinants; Mammary Glands; Polarity

20070023762 New York Univ., New York, NY USA
Prostate Cell Specific Regulation of Androgen Receptor Phosphorylation In Vivo
Taneja, Samir; Logan, Susan; Dynlacht, Brian; Garabedian, Michael; Mitchell, Derick; Nov 2006; 7 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0068
Report No.(s): AD-A465845; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465845

On the basis of previous studies in which we analyze AR phosphorylation in vivo we propose that AR phosphorylation at serines 213 and 650 regulate differential target gene expression and recruitment to gene promoters via altered interaction with other cellular transcription factors. To test this hypothesis we have conducted yeast two-hybrid analysis with the N-terminus of wild type AR as well as AR S213A and AR S213E variants. Our preliminary analysis indicates that the screen is preferentially isolating proteins with a known role in gene transcription and we are currently assessing the phosphorylation-dependence of the putative AR interacting proteins.
DTIC
Blood Cells; Hormones; In Vivo Methods and Tests; Males; Phosphorylation; Prostate Gland

20070023763 Pennsylvania Univ., Philadelphia, PA USA
Adhesion-Linked Protein Tyrosine Phosphatases, Morphogenesis and Breast Cancer Progression
Weaver, Valerie M; Jul 2005; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0496
Report No.(s): AD-A465847; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465847

Stromal-epithelial interactions regulate breast cell fate via integrin-growth factor receptor interactions that activate tyrosine kinases that are tempered by protein tyrosine phosphatases (PTPP). Through various screening approaches we

identified and profiled PTP expression in normal, malignantly transformed and phenotypically-reverted breast tissue and identified the Band 4.1 PTPs MEG1 and D1 as candidate PTP metastasis suppressor genes. We demonstrated that MEG1 and D1 expression rise dramatically early during mammary morphogenesis in response to cues from a compliant laminin-rich basement membrane that inhibit focal adhesion maturation and promote adherens junction assembly. The expression of PTP MEG1 and D1 is thereafter rapidly down regulated coincident with polarity and growth arrest. We also found that MEG1 and D1 levels are altered in tumors and that a stiffer tumor-associated stroma disrupts tissue organization and MEG and D1 expression and promotes malignant behavior of MECs. Because inhibiting mechanical force could restore tissue organization and normalize MEG and D1 expression, we are currently exploring the possibility that a reactive stiffer ECM stroma might drive malignant transformation of the breast by altering PTP function to disrupt tissue organization.
DTIC
Adhesion; Breast; Cancer; Enzymes; Mammary Glands; Phosphorus; Proteins; Tyrosine

20070023764 North Carolina Univ., Chapel Hill, NC USA
Rational Design of Rho Protein Inhibitors
Rojas, Rafael J; Sep 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0646
Report No.(s): AD-A465848; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465848

Rho GTPases are molecular switches that fluctuate between on and off states. When active, these proteins function to remodel the actin cytoskeleton by interacting with a number of downstream effector molecules. Recent studies have linked the activation of Rho GTPases with the acquisition of a metastatic phenotype in many types of cancers especially breast cancer. This proposal incorporates a rational approach to target these signaling proteins using small molecule inhibitors that would interfere with their ability to become activated by Rho family guanine nucleotide exchange factors (RhoGEFs). We have developed a high throughput screening strategy identify novel inhibitors of Rho activation are currently following up on several compounds which appear to selectively inhibit Rho activation. These compounds may form the basis of future drug development strategies for the treatment of metastatic breast cancer.
DTIC
Breast; Cancer; Drugs; Inhibitors; Mammary Glands; Molecules; Proteins

20070023765 North Carolina Univ., Chapel Hill, NC USA
Activated Ras as a Direct Therapeutic Target for Neurofibromatosis Type 1: An Innovative Approach for Identifying Classes of Inhibitors
Sondek, John; Dec 2006; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0126
Report No.(s): AD-A465849; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465849

Neurofibromatosis Type 1 (NF1) arises from the aberrant activation of Ras, a GTPases important controlling mitogenic potential. In an effort to control the aberrant activation of Ras to treat NF1 as well as other cancer, a high throughput screen was developed to screen for small molecule inhibitors of Ras activation by Sos1, a ubiquitous guanine nucleotide exchange factor that catalyzes the activation of Ras. Using this screen, several initial leads have been identified. Future work will define the efficacy and modes of action of these compounds to inhibit Sos1-catalyzed activation of Ras prior to more extensive quantitative structure-activity relationships.
DTIC
Disorders; Identifying; Inhibitors; Mental Health; Neurology; Nucleotides; Targets; Therapy

20070023766 Minnesota Univ., Minneapolis, MN USA
SoyCaP: Soy and Prostate Cancer Prevention
Hamilton-Reeves, Jim M; Kurzer, Mindy S; Slaton, Joel; Nov 2006; 92 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-1-0175
Report No.(s): AD-A465850; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465850

The main objective of this project is to evaluate the effects of soy phytoestrogens on reproductive hormones and prostate tissue markers of cell proliferation and androgen action in men at high risk of prostate cancer. The hypothesis is that alteration

of endogenous hormones is a mechanism by which soy phytoestrogens prevent prostate cancer. A randomized parallel arm study is being performed in which 58 men at high risk of prostate cancer were randomized to receive one of three dietary supplements for six months: 1) soy protein isolate containing isoflavones; 2) isoflavone-poor soy powder; or 3) isoflavone-free milk powder. Urine and blood is collected at 0 3 and 6 mc for evaluation of serum hormones and prostate specific antigen as well as urinary estrogen and phytoestrogen metabolites. At 0 and 12 mc prostate biopsies a performed to evaluate prostate tissue expression of apoptosis (Sax 501-2) proliferation (PONA) and androgen receptor density. We found isoflavone-rich soy protein isolate suppressed androgen receptor density increased urinary estrogen excretion and increased the 2:16-OH estrogen ratio in the urine. We also observed a trend toward a lower rate of prostate cancer in the men in the soy groups compared to the men in the milk group

DTIC

Cancer; Prevention; Prostate Gland; Proteins

20070023767 Vanderbilt Univ., Nashville, TN USA

The Role of (BETA)-Catenin in Androgen Receptor Signaling

Bhowmick, Neil A; Oct 2006; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-02-1-0063

Report No.(s): AD-A465851; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA465851

Previously that the ceil adhesion molecule u-catenin forms a complex with the androgen receptor (AR) and modulate itstranscription. The cross talk between u-catenin and AR signaling can play an important role in AR transcriptional in prostatecancer progression. Our preliminary data seem indicate stromally derived paracrine Wnt family members activate theepithelial frizzled receptor to enable prostate epithelial survival in an androgen deficient environment. We will continue totest the original hypothesis that there is a direct molecular interaction between u-catenin and the 0-terminus region of ARinvolved in the mechanism of prostate androgen responsiveness. The physiologic response to androgen ablation(castration) differ significantly between the prostatic stroma and epithelia despite the common expression of u-catenin andAR as evidence for the different transcriptional cofactor interactions found in prostatic epithelial and stromal cells. Ourresults support the data that show u-catenin mutations enabling u-catenin stability in prostate cancer can lead to androgenindependence. At least two genetic interventions for hormonally refractive prostate cancer have emerged from our work: I) the expression of Hic-5 in the prostatic epithelia to inhibit canonical Wnt signaling and 2) antagonism of Wnt receptorlligandinteraction such as the expression of SFRP-2.

DTIC

Cancer; Hormones; Males; Prostate Gland

20070023768 Courter Products, Boyne City, MI USA

Epidermal Growth Factor (EGF) Receptor Intron 1 CA Repeat Polymorphisms in African-American and Caucasian Males: Influence on Prostate Cancer Risk or Disease Progression and Interaction with Androgen Receptor CAG Repeat Polymorphisms

Moscatello, David K; Sep 2005; 30 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0080

Report No.(s): AD-A465852; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA465852

We are investigating the effect of a polymorphic epidermal growth factor receptor(EGFR) gene intron 1 CA repeat on prostate cancer(CaP) development, alone or in combination with a known androgen receptor gene CAG repeat polymorphism. We will characterize these repeats in DNA from African-American and Caucasian men with CaP. The data will be analyzed for any correlation using both parameters with clinical outcome (age of onset, rapid progression, or metastasis. The Human Subjects Protocol was approved by the US Army MRMC HSRRB on 24 November 2003. However, the resignation of the study coordinator at the Cooper Hospital/ University Medical Center last year and the failure of my clinical collaborator to train a new coordinator in a timely manner resulted in further delays in initiating subject recruitment. Fortunately, new clinical collaborators affiliated with Thomas Jefferson University(TJU) have agreed to participate in the study. This site has been approved by both the DOD and the HSRRB has also approved the new Human Subjects Protocol. Subject recruitment at TJU was initiated in mid-February of this year. Since recruitment began, eighty-seven (87) new subjects entered the study, and we anticipate achieving our goal of 113 more (300 total) CaP subjects by mid-2007. A new urologist and study coordinator are

now available at cooper Hospital. We have requested a no-cost extension of the grant through June 2007 in order to complete the research.
DTIC
Africa; Cancer; Clinical Medicine; Diseases; Epidermis; Genes; Polymorphism; Prostate Gland; Proteins; Races (Anthropology); Risk

20070023770 California Univ., San Francisco, CA USA
Use of Synthetic Nerve Grafts to Restore Cavernous Nerve Function Following Prostate Cancer Surgery: In Vitro and In Vivo Studies
Konety, Badrinath R; Mar 2006; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0038
Report No.(s): AD-A465857; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465857

The hypothesis of this proposal is that interposition of micropatterned biodegradable polymer based nerve grafts to replace resected or damaged cavernous nerves can facilitate return of erectile function by engendering directional nerve growth in an animal model. Micropatterned grafts have been produced using a biodogradable polymer (PDFA) The groove oharaotceristics obtained by micropatterning will be optimized to allow maximal directional neurite growth have been optimized The effect of laminin +/- polylysine. Schwann cell and neurona stem cells en neurite growth are being investigated. Tubulized sheets of the polymer with and without those factors/cells have been used to microsurgically replace resected cavernous nerve in male Sprague-Dawley rats. Control groups consisting of ungrafted animals as well as those grafted with native genitofemoral nerve have been generated. After an interval of 2 months we have attempted to observed tire restoration of physiologic function of the cavernous nerve by electrical stimulation of the nerve and/or pelvic ganglion. We are in the process of analyzing the tissue sections of the grafts that have been harvested to look for nNos expression and fluorogold staining which would indicate re-establishment of nerve integrity since that would be required to allow travel of fluorogold injected into the penile tissue to the pelvic ganglion.
DTIC
Cancer; Grafting; In Vitro Methods and Tests; In Vivo Methods and Tests; Nerves; Prostate Gland; Radicals; Transplantation

20070023777 Army War Coll., Carlisle Barracks, PA USA
Biodefense Research Supporting the DoD: A New Strategic Vision
Martinez, Coleen K; Mar 2007; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465887; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465887

The Department of Defense (DoD) has had a unique mission in biological defense research over the past 4 decades. Throughout this history, the military biological disease threats were relatively straightforward, there was little urgency linked to successful product fielding, there was no mechanism by which to gain Food and Drug Administration (FDA) product licensure, and there was little competition for mission or funds. In the post-September 11, 2001 (9/11) environment, however, the scope of potential threats has increased immeasurably, relative funding for the DoD has decreased, urgency to field solutions has skyrocketed, the FDA has provided a way forward to product licensure, and active non-DoD players in this arena have grown exponentially, aligning with newly designated, congressionally mandated funding sources. The old paradigms that governed the DoD research program structure and mission are no longer viable in this changing environment. This monograph examines the current organization of the DoD biodefense research program in light of the changing national biodefense landscape and industry best practices, and argues that all aspects of the DoD biodefense program should be consolidated with all other federal biodefense resources, including those within the National Institutes of Health, to create a single, focused, and productive program. This new agency, subordinate to the Department of Health and Human Services, will be positioned and equipped to provide medical solutions to the warfighter on the battlefield, as well as to U.S. citizens.
DTIC
Biological Weapons; Diseases; Medical Services; Military Operations; Military Technology; Research and Development

20070023788 Air Force Research Lab., Brooks AFB, TX USA

Post-Service Mortality of Air Force Veterans Occupationally Exposed to Herbicides during the Vietnam War

Ketchum, Norma S; Jun 2006; 44 pp.; In English

Report No.(s): AD-A465934; AFRL-HE-BR-TR-2006-0035; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA465934

The Air Force Health Study (AFHS) is a prospective epidemiological study of the health, mortality, and reproductive outcomes of veterans of Operation Ranch Hand, the unit responsible for aerially spraying herbicides in Vietnam from 1962 to 1971. The study began in 1982 and concludes in 2006. This report updates the authors' mortality findings published in 2005 (deaths through December, 1999) by summarizing current all-cause and cause-specific post-service mortality in veterans of Operation Ranch Hand to December 31, 2003. In this study, the mortality of 1,263 Ranch Hand veterans to December 31, 2003 was contrasted with that of 19,080 comparison veterans. The relative risk for all-cause mortality was significantly increased (RR=1.25, 95% Confidence Interval (CI): 1.1, 1.4, p<0.001). The risk of death caused by cancer was not significantly elevated (RR=1.1, 95% CI: 0.9, 1.4, p=0.39). The risk of death caused by circulatory system diseases was significantly increased in all occupations combined (RR=1.4, 95% CI: 1.1, 1.8, p=0.001) and in enlisted ground crew (RR=1.8, 95% CI: 1.3, 2.4, p<0.001), a subgroup with relatively high skin exposure to herbicides. Similarly increased risks of circulatory disease death in Ranch Hand personnel, particularly enlisted ground crew, were found among 2,758 veterans who had a physical examination. Among 2,551 veterans with dioxin assay results who had a physical examination, risk of death due to circulatory disease was significantly elevated for Ranch Hand veterans in the Low and High dioxin exposure categories (Low: RR=1.9, 95% CI: 1.1, 3.3, p=0.02; High: RR=2.3, 95% CI: 1.3, 4.0, p=0.005; trend: p<0.001).

DTIC

Armed Forces (United States); Death; Herbicides; Military Personnel; Mortality; Vietnam; Warfare

20070023894 General Accounting Office, Washington, DC USA

Operation Desert Storm. Questions Remain on Possible Exposure to Reproductive Toxicants

Wheeler, Winslow; Kroemer, Kurt; Coperland, Robert; Pickett, Penny; CHennareddy, Venkareddy; Aug 1994; 39 pp.; In English

Report No.(s): AD-A465603; GAO/PEMD-94-30; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Since their return from deployment in the Persian Gulf war, many U.S. troops have complained of health problems that they believe result from their service in the gulf region. Research has shown that U.S. troops were exposed before, during, and after the war to a variety of substances that are potentially hazardous. These include occupational hazards (such as the extensive use of diesel fuel as a sand suppressant in and around encampments, the burning of human waste with fuel oil, the presence of fuel in shower water, and the drying of sleeping bags with leaded vehicle exhaust), infectious diseases (most prominently leishmaniasis), prophylactic agents (to protect against chemical and biological weapons), depleted uranium (contained in certain ammunition and in the fragments of exploded rounds embedded in casualties), pesticides and insect repellents, possible chemical warfare agents, and a large variety of compounds contained in the extensive smoke from the oil-well fires that enveloped the region at the end of the war. Some veterans of the Persian Gulf war believe that exposure to these elements had harmful effects on not only their own health but also on the health of their spouses and children. There are also concerns about various reproductive problems and about the incidence of birth defects thought to be abnormally high among offspring born to Persian Gulf veterans. This latter subject is the focus of this report.

DTIC

Chemical Warfare; Deserts; Exposure; Hazardous Materials; Health; Infectious Diseases; Medical Services; Storms; Warfare

20070023896 NASA Johnson Space Center, Houston, TX, USA, Texas Univ., Galveston, TX, USA

A Novel in vitro Three-dimensional Skeletal Muscle Model

Marquette, Michele L.; Byerly, Diane; Sognier, Marguerite; [2007]; 25 pp.; In English; Copyright; Avail.: Other Sources

A novel three-dimensional skeletal muscle model composed of C2C12 mouse myoblasts is described. This model was generated by cultivating myoblasts in suspension using the Rotary Cell Culture System (RCCS), a unique culture environment. Single cell suspensions of myoblasts were seeded at 5 X 10(exp 5)/ml in growth medium without exogenous support structures or substrates. Cell aggregation occurred in both RCCS and suspension control (SC) conditions within 12 hours, but occurred more rapidly in the SC at all time intervals examined. RCCS cultured myoblasts fused and differentiated into a 3D construct without serum deprivation or alterations. Syncitia were quantified at 3 and 6+ days in stained thin sections. A significantly greater number of syncitia was found at 6+ days in the RCCS cultures compared to the SC. The majority of syncitia were localized to the periphery of the cell constructs for all treatments. The expression of sarcomeric Myosin Heavy Chain (MHC)

was localized at or near the periphery of the 3D construct. The majority of MHC was associated with the large cells (syncitia) of the 6+ day aggregates. These results show for the first time that myoblasts form syncitia and express MHC in the presence of growth factors and without the use of exogenous supports or substrates. This model test system is useful for investigating initial cell binding, myoblast fusion and syncitia formation, and differentiation processes.
Author
In Vitro Methods and Tests; Musculoskeletal System; Skeletal Muscle; Three Dimensional Models; Muscle Cells

20070024462 Civil Engineer Squadron (0050th), Schriever AFB, CO USA
Construct Space Innovation and Development Center (SID) at Schriever Air Force Base, Colorado
Converse, Dean P; Fernandez, Albert F; Hansen, Carmen L; Jokela, Niles V; Leonard, JoAnn M; McCart, Randall G; Modovsky, Christine; Ohlmeyer, William K; Rivera, Sheri A; Trenchik, Melissa R; Mar 2006; 179 pp.; In English
Contract(s)/Grant(s): F41624-03-D-8616; Proj-GLEN120562
Report No.(s): AD-A465898; GLEN120562; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465898

This Final Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended. The SIDC (Space Innovation and Development Center) mission (formerly the Space Warfare Center [SWC] and Space Test and Evaluation Facility [STEF]) currently operates out of five separate facilities, including temporary facilities and a downtown facility. As a result of a mission change at the Joint National Integration Center on Schriever AFB, where the SIDC currently utilizes 75,000 square feet of space, Air Force officials determined that a new facility would be constructed for use by the SIDC. The Proposed Action is to construct a new SIDC outside of the Restricted Area near the corner of Enoch Road and Irwin Avenue. An alternative site location was considered and was assessed in the EA. This EA provides an analysis of potential environmental consequences that could result from construction of the SIDC. The EA is attached and incorporated by reference to the Finding of No Significant Impact (FONSI) document, which was signed on 29 March 2006.
DTIC
Military Air Facilities; Colorado

20070024918 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Expeditionary Medical Kits: The Concept Method Applied to the Mercedes Benz Ambulance
Rakhorst-Oudendijk, M. L. W.; Hin, A. J. S.; February 2007; 8 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 013.44340
Report No.(s): TNO-DV-2006-A487; TD2006-0158; Copyright; Avail.: Other Sources

A method to compose medical equipment, developed previous, is applied in a case study on the Mercedes Benz Ambulance. The method shows to be suitable for composing, assembling and packing of a variety of expeditionary medical kits.
Author
Ambulances; Medical Equipment; Medical Services

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20070023931 NASA Johnson Space Center, Houston, TX, USA, Wyle Labs., Inc., Houston, TX, USA
Comparison of the US and Russian Cycle Ergometers
Norcross, Jason; Bentley, Jason R.; Moore, Alan D.; Hagan, R. Donald; [2007]; 19 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The purpose of this study was to compare the U.S. and Russian cycle ergometers focusing on the mechanical differences of the devices and the physiological differences observed while using the devices. Methods: First, the mechanical loads provided by the U.S. Cycle Ergometer with Vibration Isolation System (CEVIS) and the Russian Veloergometer were measured using a calibration dynamometer. Results were compared and conversion equations were modeled to determine the actual load provided by each device. Second, ten male subjects (32.9 +/- 6.5 yrs, 180.6 +/- 4.4 cm; 81.9 +/- 6.9 kg) experienced

with both cycling and exercise testing completed a standardized submaximal exercise test protocol on CEVIS and Veloergometer. The exercise protocol involved 8 sub-maximal workloads each lasting 3 minutes for a total of 24 minutes per session, or until the end of the stage when the subject reached 85% of peak oxygen consumption or age-predicted maximum heart rate (220 - age). The workload started at 50 Watts (W), increased to 100 W, and then increased 25 W every 3 minutes until reaching a peak workload of 250 W. Physiological variables were then compared at each workload by repeated measures ANOVA or paired t-tests ($p<0.05$). Results: While both CEVIS and Veloergometer produced significantly lower workloads than the displayed workload, CEVIS produced even lower loads than Veloergometer ($p<0.05$) at each indicated workload. Despite this fact, the only physiological variables that showed a significant difference between the ergometers were VE (125 - 250W), VO2 (175 and 250 W), and VCO2 (175 W). All other physiological data were not statistically different between CEVIS and Veloergometer. Conclusion: Although workloads were different between ergometers, relatively few physiological differences were observed. Therefore, CEVIS workloads of 87.5 - 262.5 W can be rounded to the nearest 25 W increment and performed on the Veloergometer.
Author
Ergometers; Physical Exercise; Exercise Physiology; Bicycle

20070024463 Air Force Research Lab., Brooks AFB, TX USA
Do Teams Adapt to Fatigue in a Synthetic C2 Task?
Chaiken, Scott; Barnes, Christopher; Harville, Donald; Miller, James C; Elliot, Linda; Dalrymple, Mathieu; Tessier, Philip; Fisher, Joseph; Jun 2004; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A465897; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465897

There has been little systematic research on fatigue for teams when compared to individuals. We investigated how team performance degrades with sustained operations on a PC-based moderate fidelity air battle management synthetic task. Teams of ISR, Strike, and Sweep battle managers conducted 8 one-hour missions from 1830 to 1030 the following day, along with performance assessment batteries (during alternate hours of testing). This modest fatigue protocol allowed us to explore team fatigue assessment for both mission outcome and team process, complementing past analyses (Elliott, Coovert, Barnes, Miller, 2003; Harville, Elliott, Coovert, Barnes, Miller, 2003). In addition, one of the team roles had lower workload, allowing us to assess whether the lighter role would receive greater workload in fatigued vs. non-fatigued conditions, as a team-adaptive fatigue countermeasure. Our results showed participants performing more poorly while fatigued both on cognitive tests and on one dimension of mission outcome (number of enemy kills) but not on others (friendly losses to fuel outs and hostile actions). General activity level for the team roles declined with fatigue (number of orders issued, information seeking). Finally, while roles recognized the value of offloading work onto the lighter role, this tendency did not significantly increase with fatigue.
DTIC
Teams; Fatigue (Biology); Workloads (Psychophysiology); Adaptation

20070024710 NASA Johnson Space Center, Houston, TX, USA, Wyle Labs., Inc., USA
Assessment of Immune Status, Latent Viral Reactivation and Stress during Long Duration Bed Rest as an Analog for Spaceflight
Crucian, Brian E.; Stowe, Raymond P.; Mehta, Satish K.; Yetman, Deborah L.; Leaf, Melanie J.; Pierson, Duane L.; Sams, Clarence F.; [2007]; 21 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

As logistical access for in-flight space research becomes more limited, the use of ground based spaceflight analogs for life science studies will increase. These studies are particularly important as NASA progresses towards the Lunar and eventually Mars missions outlined in the 2005 Vision for Space Exploration. Countermeasures must be developed to mitigate the clinical risks associated with exploration class space missions. In an effort to coordinate studies across multiple disciplines, NASA has selected 90-day bed rest as the analog of choice, and initiated the Flight Analogs Project to implement research studies with or without the evaluation of countermeasures. Although bed rest is not the analog of choice to evaluate spaceflight-associated immune dysfunction, a standard Immune Assessment was developed for subjects participating in the 90-day bed best studies. The Immune Assessment consists of: leukocyte subset distribution, T cell functional responses, intracellular cytokine production profiles, latent viral reactivation, virus specific T cell levels, virus specific T cell function, stress hormone levels and a behavioral assessment using stress questionnaires. The purpose of the assessment during the initial studies (without countermeasure) is to establish control data against which future studies (with countermeasure) will be

evaluated. It is believed that some of the countermeasures planned to be evaluated in future studies, such as exercise, pharmacologic intervention or nutritional supplementation, have the ability to impact immune function. Therefore immunity will likely be monitored during those studies. The data generated during the first three control studies showed that the subjects in general did not display altered peripheral leukocyte subsets, constitutive immune activation, significant latent viral reactivation (EBV, VZV) or altered T cell function. Interestingly, for some subjects the level of constitutively activated T cells (CD8+/CD69+) and virus-specific T cells (CMV and EBV) both decreased during the studies. This likely reflects the isolation of the subjects (from an immunological perspective) and absence of everyday subclinical challenges to the immune system. Cortisol levels (plasma and saliva) did not vary significantly during the studies. This probably reflects a lack of physiological stress during the study and the stress of readaptation to the 1xG environment at R+1. These data demonstrate the absence of significant immune alteration during 90-day bed rest, and establish control data against which future studies (including countermeasures) may be compared.
Author
Bed Rest; Immunology; Viruses; Space Flight Stress; Aerospace Medicine; Analogs; Long Duration Space Flight; Life Sciences

20070024711 NASA Johnson Space Center, Houston, TX, USA
Spaceflight Decompression Sickness Contingency Plan
Dervay, Joseph P.; July 19, 2007; 52 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024711

A viewgraph presentation on the Decompression Sickness (DCS) Contingency Plan for manned spaceflight is shown. The topics include: 1) Approach; 2) DCS Contingency Plan Overview; 3) Extravehicular Activity (EVA) Cuff Classifications; 4) On-orbit Treatment Philosophy; 5) Long Form Malfunction Procedure (MAL); 6) Medical Checklist; 7) Flight Rules; 8) Crew Training; 9) Flight Surgeon / Biomedical Engineer (BME) Training; and 10) DCS Emergency Landing Site.
CASI
Decompression Sickness; Manned Space Flight; Flight Crews; Signs and Symptoms; Mission Planning; Contingency

20070025033 NASA Johnson Space Center, Houston, TX, USA
Analysis of Chromosomal Aberrations in the Blood Lymphocytes of Astronauts after Space Flight
George, K.; Kim, M. Y.; Elliott, T.; Cucinotta, F. A.; [2007]; 1 pp.; In English; NASA Space Radiation Investigators Meeting, 13-16 Jul. 2007, Sonoma, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

It is a NASA requirement that biodosimetry analysis be performed on all US astronauts who participate in long duration missions of 3 months or more onboard the International Space Station. Cytogenetic analysis of blood lymphocytes is the most sensitive and reliable biodosimetry method available at present, especially if chromosome damage is assessed before as well as after space flight. Results provide a direct measurement of space radiation damage in vivo that takes into account individual radiosensitivity and considers the influence of microgravity and other stress conditions. We present data obtained from all twenty-five of the crewmembers who have participated in the biodosimetry program so far. The yield of chromosome exchanges, measured using fluorescence in situ hybridization (FISH) technique with chromosome painting probes, increased after space flight for all these individuals. In vivo dose was derived from frequencies of chromosome exchanges using preflight calibration curves of in vitro exposed cells from the same individual, and RBE was compared with individually measured physically absorbed dose and projected organ dose equivalents. Biodosimetry estimates using samples collected within a few weeks of return from space lie within the range expected from physical dosimetry. For some of these individuals chromosome aberrations were assessed again several months after their respective missions and a temporal decline in stable exchanges was observed in some cases, suggesting that translocations are unstable with time after whole body exposure to space radiation. This may indicate complications with the use of translocations for retrospective dose reconstruction. Data from one crewmember who has participated in two separate long duration space missions and has been followed up for over 10 years provides limited data on the effect of repeat flights and shows a possible adaptive response to space radiation exposure.
Author
Astronauts; Blood; Chromosome Aberrations; Lymphocytes; Manned Space Flight; Long Duration Space Flight; Aerospace Medicine

20070025042 NASA Johnson Space Center, Houston, TX, USA

Artificial Gravity: Effects on Bone Turnover

Heer, M.; Zwart, S /R.; Baecker, N.; Smith, S. M.; September 13, 2007; 1 pp.; In English; Medicine and Mobility, 13-15 Sep. 2007, Cologne, Germany; Copyright; Avail.: Other Sources; Abstract Only

The impact of microgravity on the human body is a significant concern for space travelers. Since mechanical loading is a main reason for bone loss, artificial gravity might be an effective countermeasure to the effects of microgravity. In a 21-day 6 head-down tilt bed rest (HDBR) pilot study carried out by NASA, USA, the utility of artificial gravity (AG) as a countermeasure to immobilization-induced bone loss was tested. Blood and urine were collected before, during, and after bed rest for bone marker determinations. Bone mineral density was determined by DXA and pQCT before and after bed rest. Urinary excretion of bone resorption markers (n-telopeptide and helical peptide) were increased from pre-bed rest, but there was no difference between the control and the AG group. The same was true for serum c-telopeptide measurements. Bone formation markers were affected by bed rest and artificial gravity. While bone-specific alkaline phosphatase tended to be lower in the AG group during bed rest (p = 0.08), PINP, another bone formation marker, was significantly lower in AG subjects than CN before and during bed rest. PINP was lower during bed rest in both groups. For comparison, artificial gravity combined with ergometric exercise was tested in a 14-day HDBR study carried out in Japan (Iwase et al. J Grav Physiol 2004). In that study, an exercise regime combined with AG was able to significantly mitigate the bed rest-induced increase in the bone resorption marker deoxypyridinoline. While further study is required to more clearly differentiate bone and muscle effects, these initial data demonstrate the potential effectiveness of short-radius, intermittent AG as a countermeasure to the bone deconditioning that occurs during bed rest and spaceflight. Future studies will need to optimize not only the AG prescription (intensity and duration), but will likely need to include the use of exercise or other combined treatments.

Author

Artificial Gravity; Microgravity; Aerospace Medicine; Human Body; Bone Mineral Content; Bone Demineralization

20070025050 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

The Distribution of Fluoxetine and Norfluoxetine in Postmortem Fluids and Tissues

Lewis, Russell J.; Johnson, Robert D.; Angier, Mike K.; June 2007; 11 pp.; In English

Contract(s)/Grant(s): AM-B-05-TOX-205

Report No.(s): DOT/FAA/AM-07/15; No Copyright; Avail.: CASI: A03, Hardcopy

During aviation accident investigations, postmortem specimens from the flight crews are submitted to the Federal Aviation Administration's Civil Aerospace Medical Institute for toxicological analysis. Fluoxetine (Prozac) is a selective serotonin reuptake inhibitor that was introduced in 1986. Certain side effects of this medication - drowsiness, dizziness, abnormal vision, diarrhea, and headache - could affect pilot performance and become a factor in an aviation accident. Our laboratory has determined the distribution of fluoxetine and its desmethyl metabolite, norfluoxetine, in various postmortem tissues and fluids from 10 fatal aviation accident cases. When available, 11 specimen types were analyzed for each case, including: blood, urine, vitreous humor, bile, liver, kidney, skeletal muscle, lung, spleen, heart muscle, and brain. Specimens were extracted using solid-phase extraction and analyzed by GC/MS. Deuterated fluoxetine and norfluoxetine were used as internal standards to eliminate any possible matrix effects during extraction. Blood fluoxetine concentrations in these 10 cases ranged from 21 to 1480 ng/mL. Most cases fell within the expected therapeutic range for patients that regularly take this drug. The distribution coefficients for fluoxetine were determined to be: urine 0.9 plus or minus 0.4, vitreous humor 0.10 plus or minus 0.03, bile 9 plus or minus 1, liver 38 plus or minus 10, lung 60 plus or minus 17, kidney 9 plus or miinus 3, spleen 20 plus or minus 5, muscle 2.2 plus or minus 0.3, brain 15 plus or minus 3, and heart 10 plus or minus 2. While the coefficient of variation (CV) for the distribution coefficients range from 11-44%, the distribution into heart, brain, muscle, spleen, and bile is relatively reproducible, each having a CV of less than or equal to 25%. To our knowledge, this is the first report presenting the distribution of fluoxetine in humans at therapeutic concentrations.

Author

Toxicology; Aerospace Medicine; Body Fluids; Tissues (Biology); Mortality; Drugs

20070025082 NASA Johnson Space Center, Houston, TX, USA

Evident Biological Effects of Space Radiation in Astronauts

Wu, Honglu; October 25, 2004; 1 pp.; In English; 13th Annual Meeting of the Council on Ionizing Radiation Measurements and Standards (CIRMS), 25-27 Oct. 2004, Gaithersburg, MD, USA; No Copyright; Avail.: Other Sources; Abstract Only

Though cancer risks are the primary concern for astronauts exposed to space radiation and a number of astronauts have developed cancer, identifying a direct association or cause of disease has been somewhat problematic due to a lack of statistics and a lack of an appropriate control group. However, several bio,logical effects observed in astronauts are believed to be

primarily due to exposure to space radiation. Among those are, light flashes experienced by astronauts from early missions, cataract development in the crewmembers and excess chromosome aberrations detected in astronauts' lymphocytes postmission. The space radiation environment and evident biological effects will be discussed.
Author
Radiation Effects; Extraterrestrial Radiation; Cancer; Biological Effects; Astronauts; Chromosome Aberrations; Cataracts; Diseases

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20070024443 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Sleep and Alertness Management, IV, Effects of Alertness Enhancers Caffeine and Modafinil on Performance in Marmosets
Philippens, I. H. C. H. M.; vanVliet, S. A. M.; Jongsma, M. J.; Vanwersch, R. A. P.; March 2007; 35 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 014.12840
Report No.(s): TNO-DV-2006-A271; TD2006-059; Copyright; Avail.: Other Sources

Flumazenil might be effective to maintain normal performance in case of an alertness demanding situation directly after taking a hypnotic. However, in case personnel have to be alert during a time of the day that the circadian rhythm is programmed for sleep, the use of wake promoting drugs might be more efficient. The alertness enhancer caffeine counteracted the sleep deprivation induced decline on the performance and activity. Modafinil even improved the activity. Chronic use of caffeine or modafinil did not negatively affect the performance and the activity during daytime and resulted in comparable effects as after a single use of these compounds. This means that caffeine and modafinil are both effective in reducing the sleep deprivation induced declines in performance. Moreover, the stimulants remain effective when used in combination with a hypnotic and even after chronic use no worsening of day time performance was observed. Modafinil reach its maximum effect 2-4 hours after oral administration indicating that it can only be used in situation in which the operation is planned by beforehand. Caffeine, a fast and short acting compound, should be useful for short scenarios. In case long term improved alertness is needed a slow release administration will be needed.
Author
Alertness; Sleep; Stimulants; Wakefulness

20070025046 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Participant Assessments of Aviation Safety Inspector Training for Technically Advanced Aircraft
Chidester, Thomas; Hackworth, Carla; Knecht, William; June 2007; 14 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AHRR-521
Report No.(s): DOT/FAA/AM-07/16; No Copyright; Avail.: CASI: A03, Hardcopy

Technically advanced 'glass cockpit' aircraft are making their way into general aviation. Aside from technical challenges presented by learning any new system, pilots report some difficulty in acquiring a conceptual understanding of the functions offered by the avionics, developing system monitoring skills and habits, developing mode management and awareness skills, understanding when and when not to use automation, and maintaining manual flying skills. Operating aircraft with advanced avionics requires an additional set of knowledge elements and skills. Currently, Federal Aviation Administration (FAA) aviation safety inspectors are required to inspect technically advanced aircraft, check certified flight instructors, and conduct surveillance of designated pilot examiners who are certifying pilots operating technically advanced aircraft. Therefore, the FAA collaborated with researchers from National Aeronautics and Space Administration and Embry-Riddle Aeronautical University to develop and implement training for aviation safety inspectors on technically advanced aircraft. This paper reports initial participant evaluations of the course.
Author
Avionics; General Aviation Aircraft; Training Analysis; Pilot Training; Pilot Support Systems

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20070023759 Air Force Research Lab., Wright-Patterson AFB, OH USA
Value Focused Thinking: Guided C2 System Interface Design
Miller, Janet E; Jun 2004; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465838; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465838

Interfaces, from displays for command and control to screens for military intelligence analysts, are the gateways to the underlying software technology. Despite how state-of-the-art and sophisticated the underlying algorithms are, if the interface does not address the user s critical functions, the software capabilities will be underutilized. Therefore, design of the interface is critical to ensure the user has the right information displayed at the right time in the right way. Meeting this goal within project constraints is a challenge. Therefore, a framework is needed to guide development so that resources can be focused on the most relevant aspects of the interface development. Value Focused Thinking (VFT) provides an objective methodology that is well suited for handling multiobjective problems such as interface design. In this paper, the VFT methodology will be described and a specific VFT hierarchy that was developed with the Air Force Research Laboratory will be explained. Discussions show that VFT can be more generally applied to gain understanding for Command and Control (C2)- specific software development and that the described research can be used for guiding the development of software tools for C2 functions.
DTIC
Command and Control; Human-Computer Interface; Systems Engineering

20070023893 Oak Ridge Inst. of Nuclear Studies, Inc., TN USA
Workplace Breathing Rates: Defining Anticipated Values and Ranges for Respirator Certification Testing
Caretti, David M; Gardner, Paul D; Coyne, Karen M; Sep 2004; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465595; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Test methods currently used by the National Institute for Occupational Safety and Health (NIOSH) are designed to assure that respirators meet a minimum level of efficacy when tested under standard laboratory protocols. For air-purifying respirators (APRs), the primary performance tests most affected by airflow rate are filter gas-life capacity, particulate filter efficiency, and respirator breathing resistances. Presently, NIOSH measures all three parameters using constant-rate airflow conditions. An analysis of the measured and estimated minute volumes contained in the literature indicated a range from about 8 to 162 L min(exp -1) for unencumbered ventilation and work activities that spanned from mild to exhaustive. Based on an empirical relationship between minute volume and peak inspiratory flow (PIF), peak flows between 72 min(exp-1) and 183 L min (exp -1) would be expected for the mean minute volume for 38.5 L min(exp -1). The anticipated range of PIF rates for the 95th percentile minute volume is between 182 L min(exp -1) and 295 min(exp -1). The results of this literature review suggest an increases in cyclic flow rates used for respirator certification testing should be considered to better represent ventilation rates found in the workplace.
DTIC
Certification; Respirators

20070024699 Brooks (F. J.) and Associates, PLLC, Minneapolis, MN, USA
Activity Monitoring
Nelson, K. S., Inventor; Bischoff, B. J., Inventor; 16 Dec 03; 20 pp.; In English
Contract(s)/Grant(s): NIA-1R41AG022751-01
Patent Info.: Filed Filed 16 Dec 03; US-Patent-Appl-SN-10-737-076
Report No.(s): PB2007-102617; No Copyright; Avail.: CASI: A03, Hardcopy

Embodiments of the present invention relate to methods, devices, and systems to monitor activity. One method to monitor activity includes monitoring a sensor activated by an individual. The method also includes recording activation of the sensor, determining a behavior routine of the individual based on recorded activations of the sensor, and analyzing the recorded sensor

activations to determine a behavior routine. The method also includes identifying a change in the behavior routine based on the analysis of the recorded sensor activations.
NTIS
Human Behavior; Sensors

20070024767 Lawrence Livermore National Lab., Livermore, CA USA
Facility Safety Plan B360 Complex CMLS-411r0
Cooper, G. A.; Jan. 11, 2007; 63 pp.; In English
Report No.(s): DE2007-899426; UCRL-TR-227217; No Copyright; Avail.: National Technical Information Service (NTIS)

Lawrence Livermore National Laboratory's (LLNL) Environmental, Safety and Health (ES&H) policy is that all operations must be planned and performed safely for the protection of workers, the public, the environment, and limit possible loss to property, facilities and equipment assigned to this directorate. In addition to observing LLNL policies contained in the Environment, Safety, and Health (ES&H) Manual, LLNL workers will comply with applicable federal, state, and local regulations when conducting any activity that the Chemistry, Materials and Life Sciences (CMLS) Directorate has managerial control or oversight. Management has determined that the safety controls specified within this Facility Safety Plan (FSP) must also be followed to ensure that the operation is successfully performed efficiently and safely within this facility. Any operations conducted in this Complex that involve activities not commonly performed by the public require an Integration Work Sheet (IWS) or IWS/Safety Plan (IWS/SP) that specifically assesses the responsibilities, hazards and controls to conduct the operation safely. Everyone who enters this area (including students, workers, visitors, and consultants) must follow the applicable requirements in this FSP. Each person is expected to protect himself/herself and others from injury or illness. Regular facility occupants are expected to guide and govern visitors and assist new or temporary occupants in understanding and following this plan.
NTIS
Environment Protection; Safety

20070024840 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands
Present State of CBRN Decontamination Methodologies
Boone, C. M.; March 2007; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 014.17718
Report No.(s): TNO-DV 2007 A028; TD2007-0020; Copyright; Avail.: Other Sources

Decontamination is defined as the removal and/or neutralization of chemical, biological, radiological and/or nuclear (CBRN) contamination. In this report, the present state of the art of decontamination technologies is discussed. divided into physical, chemical, enzymatic and energetic decontamination. Advantages and disadvantages of the available methods are given, as well as the applicability towards CBRN agents and toxic industrial chemicals (TICS) and the commercial status. The report will be yearly updated (from 2006-2009) with the latest developments.
Author
Decontamination; Contaminants; Toxic Hazards; Radiation Hazards; Biological Weapons

20070024914 National Center for Education Statistics, Washington, DC, USA, Bureau of the Census, Washington, DC, USA, Education Statistics Services Inst., Washington, DC, USA
Documentation for the NCES (National Center for Education Statistics) Common Core of Data, National Public Education Financial Survey (NPEFS), School Year 2002-03, Fiscal Year (FY) 2003. Preliminary File
Ave, E. P.; Hill, J.; Johnson, F.; Apr. 2005; 98 pp.; In English
Report No.(s): PB2007-108590; NCES-2005-358; No Copyright; Avail.: CASI: A05, Hardcopy

This documentation contains a brief description of the survey collection, along with information required to understand and access the data files. These data were collected by the National Center for Education Statistics (NCES), a branch of the Institute of Education Sciences in the U.S. Department of Education, and the Governments Division of the U.S. Census Bureau. NCES is authorized to collect these data by Congress through the National Education Statistics Act of 1995, section 404(a), (20 U.S.C. 9003(a)). The data on the files are based on information from state education agencies (SEAs) for fiscal year 2003 (school year 2002-2003). There is a record for each state, the District of Columbia and four of the outlying areas (American Samoa, Northern Marianas, Puerto Rico and Virgin Islands). Guam did not report any data. The data were collected through the National Public Education Financial Survey (NPEFS) of the Common Core of Data (CCD) series. These data are presented by state and contain revenue data by source and expenditure data by function and object. Average daily attendance

is also provided. Total student membership from the 2002-2003 Common Core of Data State Nonfiscal Survey has also been added. Information from the fiscal year 2003 data plan appears at the end of the documentation.
NTIS
Education; Schools; Surveys; Statistical Analysis

20070024915 National Center for Education Statistics, Washington, DC, USA, Bureau of the Census, Washington, DC, USA, Education Statistics Services Inst., Washington, DC, USA
Documentation for the 2004-05 Teacher Follow-Up Survey
Cox, S.; Parmer, R.; Tourkin, S.; Warner, T.; Lyter, D. M.; Mar. 2007; 251 pp.; In English
Report No.(s): PB2007-108589; NCES-2007-349; No Copyright; Avail.: CASI: A12, Hardcopy

TFS is a follow-up survey of selected elementary and secondary school teachers who participated in the Schools and Staffing Survey (SASS). SASS is the largest, most extensive survey of kindergarten through 12th grade (K12) school districts, schools, teachers, and administrators in the USA today. It provides data on the characteristics and qualifications of teachers and principals, teacher hiring practices, professional development, class size, and other conditions in schools across the nation. TFS focuses on a sample of teachers who participated in SASS, including those teachers who left the K12 teaching profession and those who continue to teach. TFS includes teacher data from public (including public charter) and private schools, similar to SASS. However, TFS does not include teachers who taught in a school funded by the Bureau of Indian Affairs (BIA) during the SASS school year due to insufficient sample sizes in TFS. Together, SASS and TFS data provide a multitude of opportunities for analysis and reporting on elementary and secondary educational issues.
NTIS
Education; Instructors; Schools; Surveys

20070024934 Sandia National Labs., Albuquerque, NM USA
Final LDRD Report Human Interaction with Complex Systems: Advances in Hybrid Reachability and Control
Oishi, M. M.; Aug. 2006; 28 pp.; In English
Report No.(s): DE2007-899366; SAND2006-5560; No Copyright; Avail.: Department of Energy Information Bridge

This document describes new advances in hybrid reachability techniques accomplished during the course of a one-year Truman Postdoctoral Fellowship. These techniques provide guarantees of safety in complex systems, which is especially important in high-risk, expensive, or safety-critical systems. My work focused on new approaches to two specific problems motivated by real-world issues in complex systems: (1) multi-objective controller synthesis, and (2) control for recovery from error. Regarding the first problem, a novel application of reachability analysis allowed controller synthesis in a single step to achieve (a) safety, (b) stability, and (c) prevent input saturation. By extending the state to include the input parameters, constraints for stability, saturation, and envelope protection are incorporated into a single reachability analysis. Regarding the second problem, a new approach to the problem of recovery provides (a) states from which recovery is possible, and (b) controllers to guide the system during a recovery maneuver from an error state to a safe state in minimal time. Results are computed in both problems on nonlinear models of single longitudinal aircraft dynamics and two-aircraft lateral collision avoidance dynamics.
NTIS
Complex Systems; Human Factors Engineering; Interactive Control

20070025035 NASA Johnson Space Center, Houston, TX, USA
Mark III Space Suit Mobility: A Reach Evaluation Case Study
Thaxton, Sherry S.; Abercromby, Andrew F. J.; Onady, Elizabeth A.; Rajulu, Sudhakar L.; June 12, 2007; 59 pp.; In English; Digital Human Modeling for Design and Engineering, 12-14 Jun. 2007, Seattle, WA, USA; Original contains color illustrations
Report No.(s): 07DHM-31; Copyright; Avail.: Other Sources

A preliminary assessment of the reach envelope and field of vision (FOV) for a subject wearing a Mark III space suit was requested for use in human-machine interface design of the Science Crew Operations and Utility Testbed (SCOUT) vehicle. The reach and view of two suited and unsuited subjects were evaluated while seated in the vehicle using 3-dimensional position data collected during a series of reaching motions. Data was interpolated and displayed in orthogonal views and cross-sections. Compared with unsuited conditions, medio-lateral reach was not strongly affected by the Mark III suit, whereas vertical and antero-posterior reach were inhibited by the suit. Lateral FOV was reduced by approximately 40 deg. in the suit.

The techniques used in this case study may prove useful in human-machine interface design by providing a new means of developing and displaying reach envelopes.
Author
Space Suits; Man Machine Systems; Spacecrews; Field of View; Extravehicular Activity; Motion; Mars Roving Vehicles; Moon

20070025055 NASA Johnson Space Center, Houston, TX, USA
Oxygen Generation from Carbon Dioxide for Advanced Life Support
Bishop, s. R.; Duncan, K. L.; Hagelin-Weaver, H. E.; Neal, L.; Paul, H. L.; Wachsman, E. D.; [2007]; 1 pp.; In English; 212th Meeting of the Electrochemical Society, 7-12 Oct. 2007, Washington, DC, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNJ06HB01C; 831384.06.04.01.05.10; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025055

The partial electrochemical reduction of CO2 using ceramic oxygen generators (COGs) is well known and has been studied. Conventional COGs use yttria-stabilized zirconia (YSZ) electrolytes and operate at temperatures greater than 700 C (1, 2). Operating at a lower temperature has the advantage of reducing the mass of the ancillary components such as insulation. Moreover, complete reduction of metabolically produced CO2 (into carbon and oxygen) has the potential of reducing oxygen storage weight if the oxygen can be recovered. Recently, the University of Florida developed ceramic oxygen generators employing a bilayer electrolyte of gadolinia-doped ceria and erbia-stabilized bismuth oxide (ESB) for NASA s future exploration of Mars (3). The results showed that oxygen could be reliably produced from CO2 at temperatures as low as 400 C. These results indicate that this technology could be adapted to CO2 removal from a spacesuit and other applications in which CO2 removal is an issue. This strategy for CO2 removal in advanced life support systems employs a catalytic layer combined with a COG so that the CO2 is reduced completely to solid carbon and oxygen. First, to reduce the COG operating temperature, a thin, bilayer electrolyte was employed. Second, to promote full CO2 reduction while avoiding the problem of carbon deposition on the COG cathode, a catalytic carbon deposition layer was designed and the cathode utilized materials shown to be coke resistant. Third, a composite anode was used consisting of bismuth ruthenate (BRO) and ESB that has been shown to have high performance (4). The inset of figure 1 shows the conceptual design of the tubular COG and the rest of the figure shows schematically the test apparatus. Figure 2 shows the microstructure of a COG tube prior to testing. During testing, current is applied across the cell and initially CuO is reduced to copper metal by electrochemical pumping. Then the oxygen source becomes the CO/CO2. This presentation details the results of testing the COG.
Author
Oxygen Production; Cerium Compounds; Yttria-Stabilized Zirconia; Solidified Gases; Electrolytes; Life Support Systems; Weight Reduction; Operating Temperature

55
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*.

20070023938 NASA Johnson Space Center, Houston, TX, USA
Comment on 'on Impact'
McKay, David S.; [2007]; 1 pp.; In English; Copyright; Avail.: Other Sources

The author responds to an article refuting research about evidence of ancient life on Mars.
Author
Exobiology; Extraterrestrial Life; Mars (Planet); Planetary Geology; SNC Meteorites

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20070024679 Lawrence Livermore National Lab., Livermore, CA USA
Formal Specification of the OpenMP Memory Model
Bronevetsky, G.; de Supinski, B. R.; May 18, 2006; 17 pp.; In English
Report No.(s): DE2007-899396; UCRL-CONF-221452; No Copyright; Avail.: Department of Energy Information Bridge

OpenMP is an important API for shared memory programming, combining shared memory's potential for performance with a simple programming interface. Unfortunately, OpenMP lacks a critical tool for demonstrating whether programs are correct: a formal memory model. Instead, the current official definition of the OpenMP memory model (the OpenMP 2.5 specification (1)) is in terms of informal prose. As a result, it is impossible to verify OpenMP applications formally since the prose does not provide a formal consistency model that precisely describes how reads and writes on different threads interact. This paper focuses on the formal verification of OpenMP programs through a proposed formal memory model that is derived from the existing prose model. Our formalization provides a two-step process to verify whether an observed OpenMP execution is conformant. In addition to this formalization, our contributions include a discussion of ambiguities in the current prose-based memory model description. Although our formal model may not capture the current informal memory model perfectly, in part due to these ambiguities, our model reflects our understanding of the informal models intent.
NTIS
Parallel Programming; Application Programming Interface; Memory (Computers); Models

20070024683 Lawrence Livermore National Lab., Livermore, CA USA
How to Implement a Protocol for Babel RMI
Kumfert, G.; Leek, J.; Mar. 31, 2006; 37 pp.; In English
Report No.(s): DE2007-899405; UCRL-TR-220292; No Copyright; Avail.: Department of Energy Information Bridge

RMI support in Babel has two main goals: transparency & flexibility. Transparency meaning that the new RMI features are entirely transparent to existing Babelized code; flexibility meaning the RMI capability should also be flexible enough to support a variety of RMI transport implementations. Babel RMI is a big success in both areas. Babel RMI is completely transparent to already Babelized implementation code, allowing painless upgrade, and only very minor setup changes are required in client code to take advantage of RMI. The Babel RMI transport mechanism is also extremely flexible. Any protocol that implements Babel's minimal, but complete, interface may be used as a Babel RMI protocol. The Babel RMI API allows users to select the best protocol and connection model for their application, whether that means a WebServices-like-client-server model for use over a WAP, or a faster binary peer-to-peer protocol for use on different nodes in a leadership-class supercomputer. Users can even change protocols without recompiling their code. The goal of this paper is to give network researchers and protocol implementors the information they need to develop new protocols for Babel RMI. This paper will cover both the high level interfaces in the Babel RMI API, and the low level details about how Babel RMI handles RMI objects.
NTIS
Computer Programs; Protocol (Computers)

20070024686 Lawrence Livermore National Lab., Livermore, CA USA
Experimental Comparison of Block Matching Techniques for Detection of Moving Objects
Love, N. S.; Kamath, C.; May 18, 2006; 14 pp.; In English
Report No.(s): DE2007-899415; UCRL-CONF-221386; No Copyright; Avail.: National Technical Information Service (NTIS)

The detection of moving objects in complex scenes is the basis of many applications in surveillance, event detection, and tracking. Complex scenes are difficult to analyze due to camera noise and lighting conditions. Currently, moving objects are detected primarily using background subtraction algorithms, with block matching techniques as an alternative. In this paper, we complement our earlier work on the comparison of background subtraction methods by performing a similar study of block matching techniques. Block matching techniques first divide a frame of a video into blocks and then determine where each block has moved from in the preceding frame. These techniques are composed of three main components: block determination, which specifies the blocks; search methods, which specify where to look for a match; and, the matching criteria, which determine when a good match has been found. In our study, we compare various options for each component using publicly

available video sequences of a traffic intersection taken under different traffic and weather conditions. Our results indicate that a simple block determination approach is signicantly faster with minimum performance reduction, the three step search method detects more moving objects, and the mean-squared-difference matching criteria provides the best performance overall.
NTIS
Detection; Targets; Motion

20070024697 Sonnenschein Nath and Rosenthal. LLP, Chicago, IL, USA
Brain Computer Interface
Leuthardt, E. C., Inventor; Schalk, G., Inventor; Moran, D. W., Inventor; Wolpaw, J. R., Inventor; Ojemann, J. G., Inventor; 12 Dec 03; 27 pp.; In English
Contract(s)/Grant(s): NIH-NS41272; NIH-HD30146
Patent Info.: Filed Filed 12 Dec 03; US-Patent-Appl-SN-10-735-474
Report No.(s): PB2007-102614; No Copyright; Avail.: CASI: A03, Hardcopy
An electrocorticography-based brain computer interface (BCI) and related methods are described.
NTIS
Brain; Computers

20070024758 National Telecommunications and Information Administration, Washington, DC USA
Batch Video Quality Metric (BVQM) User's Manual
McFarland, M. A.; Pinson, M. H.; Wolf, S.; Dec. 2006; 34 pp.; In English
Report No.(s): PB2007-108503; NTIA-HB-06-441A; No Copyright; Avail.: CASI: A03, Hardcopy
This handbook provides a users manual for the batch video quality metric (BVQM) tool. BVQM runs under the Windows XP operating system. BVQM performs objective automated quality assessments of processed video clip batches (i.e., as output by a video system under test). BVQM reports video calibration and quality metric results such as: temporal registration, spatial registration, spatial scaling, valid region, gain/level offset, and objective video quality estimates. BVQM operates on original and processed video files only, and has no video capture capability. BVQM compares the original video clip to the processed video clip and reports quality estimates on a scale from zero to one. On this scale, zero means that no impairment is visible and one means that the video clip has reached the maximum impairment level (excursions beyond one are possible for extremely impaired video sequences).
NTIS
Batch Processing; Calibrating; Clips; Digital Television; User Manuals (Computer Programs); Video Communication

20070024759 National Telecommunications and Information Administration, Washington, DC USA
In-Service Video Quality Metric (IVQM) User's Manual
Pinson, M. H.; Wolf, S.; Dec. 2005; 32 pp.; In English
Report No.(s): PB2007-108502; NTIA-HB-06-434A; No Copyright; Avail.: CASI: A03, Hardcopy
The purpose of this handbook is to provide a users manual for the in-service video quality metric (IVQM) tool. IVQM performs automated processing of live video signals. This program runs under the Windows XP operating system on two PCs communicating through an IP connection. IVQM performs image acquisition, temporal registration, other video calibration (spatial registration, spatial scaling, valid region, and gain/level offset), and video quality estimation. IVQM compares the source video sequence to the destination video sequence (i.e., as output by the video system under test). Each program alternates between video capture and video analysis. Every source/destination video sequence pair is processed through three main steps. First, the sequences are buffered onto a hard drive. Second, the sequences are temporally registered. Third, the video quality of the destination video sequence is estimated. Quality estimates are reported on a scale of zero to one, where zero means that no impairment is visible and one means that the video clip has reached the maximum impairment level. Some video sequences may also be used to estimate other calibration values (spatial registration, spatial scaling, valid region estimation, and gain/level offset). The user has control over how often these other calibration values are calculated.
NTIS
Calibrating; Digital Television; User Manuals (Computer Programs); Video Signals

20070024768 Lawrence Livermore National Lab., Livermore, CA USA
How the Common Component Architecture Advances Computational Science
Kumfert, G.; Bernholdt, D. E.; Epperly, T.; Kohl, J.; McInnes, L. C.; Jun. 26, 2006; 16 pp.; In English
Report No.(s): DE2007-899436; UCRL-CONF-222279; No Copyright; Avail.: National Technical Information Service (NTIS)

Computational chemists are using Common Component Architecture (CCA) technology to increase the parallel scalability of their application ten-fold. Combustion researchers are publishing science faster because the CCA manages software complexity for them. Both the solver and meshing communities in SciDAC are converging on community interface standards as a direct response to the novel level of interoperability that CCA presents. Yet, there is much more to do before component technology becomes mainstream computational science. This paper highlights the impact that the CCA has made on scientific applications, conveys some lessons learned from five years of the SciDAC program, and previews where applications could go with the additional capabilities that the CCA has planned for SciDAC 2.
NTIS
Architecture (Computers); Parallel Processing (Computers)

20070024821 Lawrence Livermore National Lab., Livermore, CA USA
ParaDiS on Blue Gene/L: Stepping up to the Challenge
Hommes, G.; Arsenlis, A.; Bulalov, Y.; Cai, W.; Cook, R.; Jun. 15, 2006; 14 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898509; UCRL-CONF-222086; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper reports on the efforts to enable fully scalable simulations of Dislocation Line Dynamics (DLD) for direct calculations of strength of crystalline materials. DLD simulations are challenging and do not lend themselves naturally to parallel computing. Through a combinations of novel physical approaches, mathematical algorithms and computational science developments, a new DLD code ParaDiS is shown to take meaningful advantage of BG/L and, by doing so, to enable discovery class science by computation.
NTIS
Color; Crystallography; Parallel Processing (Computers)

20070024830 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Program Review for Information Security Management Assistance (PRISMA)
Bowen, P.; Kissel, R.; Jan. 2007; 60 pp.; In English
Report No.(s): PB2007-108537; NISTIR-7358; No Copyright; Avail.: National Technical Information Service (NTIS)

Several sources of guidance, policies, standards and legislative acts provide many requirements for the federal agencies when protecting entrusted information. Various assessments, reviews, and evaluations are an outcome of these information security requirements to monitor federal agency compliance. The manner in which these monitoring approaches are implemented may be very different, impacting agency resource constraints. The Federal Information Security Management Act (FISMA) of 2002 charged NIST to provide technical assistance to agencies regarding compliance with the standards and guidelines developed for securing information systems, as well as information security policies, procedures, and practices. This Interagency Report provides an overview of the NIST Program Review for Information Security Management Assistance (PRISMA) methodology. PRISMA is a tool developed and implemented by NIST for reviewing the complex information security requirements and posture of a federal information security program. This report is provided as a framework for instructional purposes s to assist information security personnel, internal reviewers, auditors, and agency Inspector General (IG) staff personnel in reviewing information security programs.
NTIS
Information Management; Computer Information Security; Governments

20070024833 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Guide to Intrusion Detection and Prevention Systems (IDPS). Recommendations of the National Institute of Standards and Technology. Computer Security
Scarfone, K.; Mell, P.; Feb. 2007; 127 pp.; In English
Report No.(s): PB2007-108536; NIST/SP-800-94; No Copyright; Avail.: National Technical Information Service (NTIS)

This publication describes the characteristics of IDPS technologies and provides recommendations for designing,

implementing, configuring, securing, monitoring, and maintaining them. The types of IDPS technologies are differentiated primarily by the types of events that they monitor and the ways in which they are deployed. This publication discusses the following four types of IDPS technologies: Network-Based, which monitors network traffic for particular network segments or devices and analyzes the network and application protocol activity to identify suspicious activity. Wireless, which monitors wireless network traffic and analyzes it to identify suspicious activity involving the wireless networking protocols themselves. Network Behavior Analysis (NBA), which examines network traffic to identify threats that generate unusual traffic flows, such as distributed denial of service (DDoS) attacks, certain forms of malware, and policy violations (e.g., a client system providing network services to other systems) ands Host-Based, which monitors the characteristics of a single host and the events occurring within that host for suspicious activity.
NTIS
Computer Information Security; Detection; Prevention; Warning Systems

20070024834 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Information Security Handbook: A Guide for Managers. Recommendations of the National Institute of Standards and Technology. Information Security
Bowen, P.; Hash, J.; Wilson, M.; Oct. 2006; 176 pp.; In English
Report No.(s): PB2007-108534; NIST/SP-800-100; No Copyright; Avail.: National Technical Information Service (NTIS)

This handbook provides a broad overview of information security program elements to assist managers in understanding how to establish and implement an information security program. Typically, the organization looks to the program for overall responsibility to ensure the selection and implementation of appropriate security controls and to demonstrate the effectiveness of satisfying their stated security requirements. The topics within this document were selected based on the laws and regulations relevant to information security, including the Clinger-Cohen Act of 1996, the Federal Information Security Management Act (FISMA) of 2002, and Office of Management and Budget (OMB) Circular A-130. The material in this handbook can be referenced for general information on a particular topic or can be used in the decision-making process for developing an information security program. National Institute of Standards and Technology (NISTIR) Interagency Report 7298 provides a summary glossary for the basic security terms used throughout this document. While reading this handbook, please consider that the guidance is not specific to a particular agency. Agencies should tailor this guidance according to their security posture and business requirements.
NTIS
Computer Information Security; Handbooks; Data Processing

20070024839 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
Algorithms for the Fusion of Two Sets of (Sonar) Data
deTheije, P. A. M.; vanMoll, C. A. M.; December 2006; 56 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): V506; TNO Proj. 015.34675
Report No.(s): TNO-DV-2006-A5 18; TD2006-0178; Copyright; Avail.: Other Sources

In this report we study different methods to combine sonar contacts as observed by two sonars. The sonar contacts are given realistic position errors, which makes their association non-trivial. First, for a single pair of contacts the most-likely position of the true underlying target position is derived. Based on this, the probability that two observed contacts originate from a single object is calculated. Based on these theoretical derivations, different association methods are evaluated using simulations, in which both targets-of-interest and false alarms are inserted. It is concluded that an 'OR'-fusion of the two sets of sonar contacts gives a much better performance than an 'AND'-fusion; the latter induces severe losses. The results are insensitive to the number of targets inserted, to the exact magnitude of the position errors, and to the amplitude distribution of the targets-of-interest.
Author
Algorithms; Sonar; Data Processing; Multisensor Fusion; Data Integration

20070024879 Government Accountability Office, Washington, DC, USA
Privacy: Lessons Learned about Data Breach Notification
Apr. 2007; 78 pp.; In English
Report No.(s): PB2007-108735; GAO-07-657; No Copyright; Avail.: CASI: A05, Hardcopy

A May 2006 data breach at the Department of Veterans Affairs (VA) and other similar incidents since then have heightened awareness of the importance of protecting computer equipment containing personally identifiable information and responding

effectively to a breach that poses privacy risks. GAO's objective was to identify lessons learned from the VA data breach and other similar federal data breaches regarding effectively notifying government officials and affected individuals about data breaches. To address this objective, GAO analyzed documentation and interviewed officials at VA and five other agencies regarding their responses to data breaches and their progress in implementing standardized data breach notification procedures. The cases at the other agencies were chosen because, like the VA case, they involved loss or theft of computing equipment and relatively large numbers of affected individuals (10,000 or more).
NTIS
Computer Information Security; Privacy; Protection

20070024932 Department of Energy, Las Vegas, NV, USA
Tabulation of Fundamental Assembly Heat and Radiation Source Files
deBues, T.; Ryan, J. C.; Oct. 2006; 12 pp.; In English
Report No.(s): DE2007-899285; No Copyright; Avail.: Department of Energy Information Bridge
The purpose of this calculation is to tabulate a set of computer files for use as input to the WPLOAD thermal loading software. These files contain details regarding heat and radiation from pressurized water reactor (PWR) assemblies and boiling water reactor (BWR) assemblies. The scope of this calculation is limited to rearranging and reducing the existing file information into a more streamlined set of tables for use as input to WPLOAD. The electronic source term files used as input to this calculation were generated from the output files of the SAS2H/ORIGIN-S sequence of the SCALE Version 4.3 modular code system, as documented in References 2.1.1 and 2.1.2, and are included in Attachment II.
NTIS
Computer Storage Devices; Heat Sources; Radiation Sources

20070024946 Geological Survey, Reston, VA USA, Minnesota Pollution Control Agency, Saint Paul, MN, USA
Methods Used to Compute Low-Flow Frequency Characteristics for Continuous-Record Streamflow Stations in Minnesota, 2006
Winterstein, T. A.; Arntson, A. D.; Mitton, G. B.; January 2007; 22 pp.; In English
Report No.(s): PB2007-108547; USGS-OFR-2007-1033; No Copyright; Avail.: CASI: A03, Hardcopy
The 1-, 7-, and 30-day low-flow series were determined for 120 continuous-record streamflow stations in Minnesota having at least 20 years of continuous record. The 2-, 5-, 10-, 50-, and 100--year statistics were determined for each series by fitting a log Pearson type III distribution to the data. The methods used to determine the low-flow statistics and to construct the plots of the low-flow frequency curves are described. The low-flow series and the low-flow statistics are presented in tables and graphs.
NTIS
Flow Characteristics; Low Frequencies; Pearson Distributions

20070024977 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Accelerating Network Traffic Analytics Using Query-Driven Visualization
Bethey, W. E.; Campbell, S.; Dart, E.; Stockinger, K.; Wu, K.; Jul. 29, 2006; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898855; LBNL--59891; No Copyright; Avail.: National Technical Information Service (NTIS)
Realizing operational analytics solutions where large and complex data must be analyzed in a time-critical fashion entails integrating many different types of technology. This paper focuses on an interdisciplinary combination of scientific data management and visualization/analysis technologies targeted at reducing the time required for data filtering, querying, hypothesis testing and knowledge discovery in the domain of network connection data analysis. We show that use of compressed bitmap indexing can quickly answer queries in an interactive visual data analysis application, and compare its performance with two alternatives for serial and parallel filtering/querying on 2.5 billion records worth of network connection data collected over a period of 42 weeks. Our approach to visual network connection data exploration centers on two primary factors: interactive ad-hoc and multiresolution query formulation and execution over n dimensions and visual display of then-dimensional histogram results. This combination is applied in a case study to detect a distributed network scan and to then identify the set of remote hosts participating in the attack. Our approach is sufficiently general to be applied to a diverse set of data understanding problems as well as used in conjunction with a diverse set of analysis and visualization tools.
NTIS
Data Management; Traffic; Information Systems; Query Languages; Hypotheses

20070024988 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Guide to Integrating Forensic Techniques into Incident Response: Recommendations of the National Institute of Standards and Technology. Computer Security

Kent, K.; Chevalier, S.; Grance, T.; Dang, H.; Aug. 2006; 121 pp.; In English

Report No.(s): PB2007-108490; NIST/SP-800-86; No Copyright; Avail.: CASI: A06, Hardcopy

This guide provides detailed information on establishing a forensic capability, including the development of policies and procedures. Its focus is primarily on using forensic techniques to assist with computer security incident response, but much of the material is also applicable to other situations. Because different organizations are subject to different laws and regulations, this publication should not be used as a guide to executing a digital forensic investigation, construed as legal advice, or used as the basis for investigations of criminal activity. Instead, organizations should use this guide as a starting point for developing a forensic capability in conjunction with extensive guidance provided by legal advisors, law enforcement officials, and management.

NTIS

Computer Information Security; Law (Jurisprudence)

20070025001 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Electronic Authentication Guideline. Recommendations of the National Institute of Standards and Technology. Information Security. Version 1.0.2

Burr, W. E.; Dodson, D. F.; Polk, W. T.; Apr. 2006; 64 pp.; In English

Report No.(s): PB2007-108538; NIST/SP-800-63-REV; No Copyright; Avail.: National Technical Information Service (NTIS)

This recommendation provides technical guidance to Federal agencies implementing electronic authentication. The recommendation covers remote authentication of users over open networks. It defines technical requirements for each of four levels of assurance in the areas of identity proofing, registration, tokens, authentication protocols and related assertions.

NTIS

Computer Information Security; Identifying; Standards; Access Control

20070025029 National Inst. of Standards and Technology, Gaithersburg, MD, USA

Guide to Test, Training, and Exercise Programs for IT Plans and Capabilities: Recommendations of the National Institute of Standards and Technology. Computer Security

Grance, T.; Nolan, T.; Burke, K.; Dudley, R.; White, G.; Sep. 2006; 97 pp.; In English

Report No.(s): PB2007-108492; NIST/SP-800-84; No Copyright; Avail.: CASI: A05, Hardcopy

This document provides guidance on designing, developing, conducting, and evaluating TT&E events so that organizations can improve their ability to prepare for, respond to, manage, and recover from adverse events that may affect their missions. The scope of this document is limited to TT&E events for single organizations, as opposed to large-scale events involving multiple organizations, involving internal IT operational procedures for emergencies. This document does not address TT&E for a specific type of IT plan; rather, the TT&E methodology described in this document can be applied to TT&E events built around any IT plan or around an IT emergency-handling capability that is not necessarily documented in a plan, such as computer security incident response.

NTIS

Computer Information Security; Education; Information Systems; Physical Exercise

20070025065 Coburn (Thompson) LLP, Saint Louis, MO, USA

Investigation of Destroyed Assemblies and Identification of Components Thereof Using Texture Mapping

DiSanto, Brenda I., Editor; Hummeniuk, Bob P., Editor; Bard, Richard D., Jr., Editor; Edwards, Robert, Editor; Pitard, A. G., Editor; Hollifield, Kenneth D., Editor; Clark, Danny L., Editor; Little, Mia P., Editor; Boykin, Jeffery V., Editor; Edwards, Ken L., Editor; Zeiters, David M., Editor; 21 Jul. 2005; 7 pp.; In English

Contract(s)/Grant(s): NASA-GS-23F-0183K; NASA-1970448303

Patent Info.: Filed 23 Jul. 2004; US-Patent-Appl-10/898514; US 1005/0157919

Report No.(s): PB2007-102770; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025065

Methods are disclosed for providing a means for identifying recovered component parts of a destroyed assembly quickly and relatively easily using digital or electronic scanning techniques and comparison to virtual components that are presumed

to have constituted the original assembly. The method also provides a means for digitally rigging the component parts in three-dimensional virtual space, thereby minimizing and, in some situations, possibly eliminating any need to physical rig the component parts. The methods include texture mapping a photographic image of a component part onto a representation of the component.
Author
Assemblies; Components; Digital Techniques

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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*.

20070024426 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
An Interleaver Implementation for the Serially Concatenated Pulse-Position Modulation Decoder
Cheng, Michael K.; Moision, Bruce E.; Hamkins, Jon; Nakashima, Michael A.; May 21, 2006; 4 pp.; In English; IEEE Symposium on Circuits and Systems, 21-24 May 2006, Greece; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40098

We describe novel interleaver and deinterleaver architectures that support bandwidth efficient memory access for decoders of turbo-like codes that are used in conjunction with high order modulations. The presentation focuses on a decoder for serially concatenated pulse-position modulation (SCPPM), which is a forward-error-correction code designed by NASA to support laser communications from Mars at more than 50 megabits-per-second (Mbps). For 64-ary PPM, the new architectures effectively triple the fan-in of the interleaver and fan-out of the deinterleaver, enabling parallelization that doubles the overall throughput. The techniques described here can be readily modified for other PPM orders.
Author
Decoders; Architecture (Computers); Concatenated Codes; Pulse Position Modulation; Polynomials

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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.

20070023790 Defence Science and Technology Organisation, Edinburgh, Australia
Evaluation of the 'Mentor' Assessment and Feedback System for Air Battle Management Team Training
Best, Christopher; Burchat, Eleanore; Nov 2006; 48 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465949; DSTO-TR-1942; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465949

The Mentor software package (Calytrix Technologies, Perth, Western Australia) is gaining popularity within the Australian Defence Force (ADF) as a means by which to manage training objectives, collect performance data, and provide feedback for collective training. While the Navy has led the way in the application of this tool, it is now being put forward as an important component of an Air Warfare Assessment and Readiness Evaluation System (AWARES) for the Royal Australian Air Force (RAAF) as well as being included in the suite of tools to be used for exercises involving the Joint Combined Training Centre (JCTC). This report contains an account of an evaluation of the Mentor system and its use to provide performance assessment and feedback during a RAAF Air Battle Management team training event.
DTIC
Australia; Computer Programs; Education; Feedback

20070023791 Carnegie-Mellon Univ., Pittsburgh, PA USA
+SAFE, V1.2: A Safety Extension to CMMI-DEV, V1.2
Mar 2007; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A465950; CMU/SEI-2007-TN-006; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465950

+SAFE is an extension to CMMI for Development (CMMI-DEV) that covers safety management and safety engineering.

+SAFE supplements CMMI-DEV with two additional process areas that provide a basis for appraising or improving an organization's processes for providing safety-critical products. Developing such products requires specialized processes, skills, and experience. +SAFE is designed to identify safety strengths and weaknesses and to address identified weaknesses early in the acquisition process. +SAFE was designed to reduce the dependence of CMMI appraisers on safety domain expertise. This extension was developed for standalone use. It is not intended to be embedded in a CMMI model document, nor does it rely on any specific safety standards. However, there are intentional overlaps with CMMI model content and some safety standards. Since +SAFE is an extension of CMMI, it adopts the same assumptions, model structure, conventions, and terminology as CMMI and is affected by the general process-area and capability-level interactions inherent in CMMI. This technical report describes the +SAFE extension and how to use it to appraise an organization's capability in developing, sustaining, maintaining, and managing safety-critical products.
DTIC
Safety; Software Development Tools

20070023792 USA Joint Forces Command, Norfolk, VA USA
Technology in Coalition Training
Bolcar, Jim; Collins, Dan; Jun 2004; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465953; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465953

The Regional Security Cooperation Network (RSCN) initiative originated in the Office of the Secretary of Defense (OSD) and was subsequently designated as an activity of US Joint Forces Command. RSCN is not a physical network that requires substantial financial investment, hardware, software and technical support. Rather, it is a management improvement tool that leverages existing and exploits future information technology capabilities with the overall objective of improving training effectiveness while eliminating duplication of effort. RSCN is envisioned as an enabler of enhanced, US-led coalition education and training efforts that form the foundation of security cooperation and interoperability now and in the years to come. As OSD's lead agent for RSCN, US Joint Forces Command must articulate the potential benefits of the RSCN concept to the Combatant Commanders and leadership of DoD education and training institutions.
DTIC
Computer Programs; Education; Interoperability; Military Operations

20070023797 Raytheon Co., Sudbury, MA USA
A Distributed Collaborative Workflow Based Approach to Data Collection and Analysis
Gerecke, William; Enas, Douglas; Gottschlich, Susan; Jun 2004; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A466000; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA466000

Data Collection and Analysis (also known as After Action Review) capabilities are common requirements for many Command and Control (C2) and Modeling and Simulation (M&S) systems and architectures. In our work we have found that in order to be maximally effective, these capabilities must be designed with the military user workflow process in mind. In this paper, we present a web-enabled Data Collection and Analysis capability that (1) considers a typical military workflow whereby several users, of varying levels of technical sophistication and disparate responsibilities, will need to make use of these capabilities, (2) addresses the need to enable distributed collaboration and (3) is based on a modular multi-layered service oriented architecture so that the same distributed collaborative workflow based approach can be used to satisfy a wide range of Data Collection and Analysis needs and can enable machine-to-machine interaction by exposing web services.
DTIC
Data Acquisition; Data Management

20070024474 Defence Science Technology Lab., Fort Halstead, UK
A New Rapid ISTAR Assessment Method
Walmsley, Nicholas S; Syms, Paul R; Jun 2004; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465889; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465889

One of the most significant contributions to the Command and Control (C2) process is the input of high quality intelligence, surveillance, target acquisition and recognition (ISTAR) information, in a timely manner. In the past, the operational analysis (OA) to support this ISTAR capability has used detailed and explicit modelling, this was inflexible,

lengthy, and costly to run. A novel and more abstract approach to the assessment of ISTAR capabilities and sensor mixes has been developed, which removes the need for detailed terrain data and explicit platform-level sensor and target deployments. This paper outlines the model, and presents some example output.
DTIC
Data Systems; Intelligence; Surveillance; Target Acquisition

20070024674 Sandia National Labs., Albuquerque, NM USA
Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Plan 2: Mappings for the ASC Software Quality Engineering Practices. Version 2.0
Bocheron, E. A.; Drake, R. R.; Edwards, H. C.; Forsythe, C. A.; Heaphy, R.; Sep. 01, 2006; 45 pp.; In English
Report No.(s): DE2007-897915; SAND2006-5997; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of the Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan is to clearly identify the practices that are the basis for continually improving the quality of ASC software products. The plan defines the ASC program software quality practices and provides mappings of these practices to Sandia Corporate Requirements CPR001.3.2 and CPR001.3.6 and to a Department of Energy document, 'ASCI Software Quality Engineering: Goals, Principles, and Guidelines'. This document also identifies ASC management and software project teams responsibilities in implementing the software quality practices and in assessing progress towards achieving their software quality goals.
NTIS
Computer Programs; Project Management; Quality Control; Systems Analysis

20070025017 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Development of a State Machine Sequencer for the Keck Interferometer: Evolution, Development and Lessons Learned using a CASE Tool Approach
Rede, Leonard J.; Booth, Andrew; Hsieh, Jonathon; Summer, Kellee; June 21, 2004; 13 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, Glasgow, Scotland, June 21, 2004, 21 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40096

This paper presents a discussion of the evolution of a sequencer from a simple EPICS (Experimental Physics and Industrial Control System) based sequencer into a complex implementation designed utilizing UML (Unified Modeling Language) methodologies and a CASE (Computer Aided Software Engineering) tool approach. The main purpose of the sequencer (called the IF Sequencer) is to provide overall control of the Keck Interferometer to enable science operations be carried out by a single operator (and/or observer). The interferometer links the two 10m telescopes of the W. M. Keck Observatory at Mauna Kea, Hawaii. The IF Sequencer is a high-level, multi-threaded, Hare1 finite state machine, software program designed to orchestrate several lower-level hardware and software hard real time subsystems that must perform their work in a specific and sequential order. The sequencing need not be done in hard real-time. Each state machine thread commands either a high-speed real-time multiple mode embedded controller via CORB A, or slower controllers via EPICS Channel Access interfaces. The overall operation of the system is simplified by the automation. The UML is discussed and our use of it to implement the sequencer is presented. The decision to use the Rhapsody product as our CASE tool is explained and reflected upon. Most importantly, a section on lessons learned is presented and the difficulty of integrating CASE tool automatically generated C++ code into a large control system consisting of multiple infrastructures is presented.
Author
Software Engineering; Computer Aided Design; Interferometers; Control Systems Design; High Level Languages; Sequential Control

20070025022 NASA Johnson Space Center, Houston, TX, USA
GNC Architecture Design for ARES Simulation. Revision 3.0
Gay, Robert; June 26, 2006; 29 pp.; In English; AIAA Guidance, Navigation and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations
Report No.(s): EG-ARES-06-5; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025022

The purpose of this document is to describe the GNC architecture and associated interfaces for all ARES simulations. Establishing a common architecture facilitates development across the ARES simulations and provides an efficient mechanism for creating an end-to-end simulation capability. In general, the GNC architecture is the frame work in which all GNC

development takes place, including sensor and effector models. All GNC software applications have a standard location within the architecture making integration easier and, thus more efficient.
Derived from text
Architecture (Computers); Computerized Simulation; Guidance (Motion); Navigation; Control Systems Design

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20070023774 Space and Naval Warfare Systems Center, San Diego, CA USA
Developing and Populating the Global Information Grid for Joint and Coalition Operations: Challenges and Opportunities
Galdorisi, George; Thigpen, Dan; Jun 2004; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465868; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465868

Network Centric Operations are transforming the nature of warfare. While literally countless definitions have been offered to explain what Network Centric Operations and Network Centric Warfare, recent directives by the Assistant Secretary of Defense for Networks and Information Integration (ASD/NII) have served to bound the problem and define the elements of the Global Information Grid (GIG) -- the foundation for Network Centric Warfare. This paper addresses a critical element of this GIG construct how will the GIG be populated and developed to ensure success in Joint and coalition operations. We assert that a GIG designed to be utilized by U.S. and coalition forces and a GIG populated by a wide array of U.S. and coalition sensors and other dynamic sources of information will be a much more powerful tool than a GIG that is designed, developed, resourced and used nearly exclusively by U.S. forces. We base this assertion on the operational realities of warfighting and the lessons learned from Operational Enduring Freedom and Operation Iraqi Freedom. For example, in the naval context, in the spring of 2002, during Operation Enduring Freedom, 91 coalition ships were concentrated in the Central Command Area of Responsibility. While 31 of these ships were U.S. Navy ships, 60 of these ships belonged to U.S. coalition partners. Clearly, the success of this U.S.-led operation as well as others was tremendously enhanced by the warfighting capabilities provided by a robust array of coalition assets. As the USA military builds and populates the Global Information Grid as the foundation for Network Centric Warfare the value-added of building the GIG in such a way that it both supports coalition partners and accommodates sensors and systems that these partners bring to the table is clear.
DTIC
Military Operations; Navy; Warfare

20070023798 Mitre Corp., McLean, VA USA
Systems Engineering in the Information Age: The Challenge of Mega-Systems
Stevens, Renee; Jun 2004; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A466001; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA466001

As it makes the transition from the industrial age to the information age, the Department of Defense, like other government agencies and indeed like the global business community as a whole, is moving aggressively to leverage and capitalize on advances in information technologies. The result is a clear trend away from stand-alone component systems to ones that are richly interconnected and increasingly interdependent. We call these mega-systems. This paper focuses on the engineering of this class of systems which is characterized by increasing scale, the nature and pace of change of the technologies involved, the complexity of system interactions and, perhaps most important, the fact that a single organization rarely owns and has complete control over the mega-system. We hypothesize that engineering these mega-systems is inherently different from engineering large-scale but essentially well-bounded monolithic systems. We develop a framework to understand the differences between well-bounded systems and this new class of systems. On the basis of these insights, we propose an approach to engineering mega-systems that emphasizes experimentation over rigorous requirements definition and continuous evolution over a ‘grand design’
DTIC
Systems Engineering; Systems Integration

20070024455 Defence Science and Technology Organisation, Canberra, Australia
Adaptation of Collaborative Applications for Network Quality Variation
Au, T A; Tran, Cindy; Jun 2004; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465976; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465976

The ability to access information on demand is a critical capability in the battlefield. Deployed military headquarters are often located in a challenging tactical environment, whereby major disruptions to collaborative work lead to an impairment in the operational capability. These challenges in turn stem mainly from volatile connectivity and sporadic network mobility, which are a feature of the unpredictable nature of the battlefield. A network management approach based entirely on resource reservation is especially difficult in this environment since disturbances and unanticipated events often occur with network-based applications. This paper explores the concept of network awareness in support of continued operation in an unpredictable battlefield environment. In particular, we propose a platform-independent event-delivery framework to facilitate application adaptation, and demonstrate the advantages of this approach in supporting the proactive management of applications.
DTIC
Communication Networks; Command and Control; Network Control

20070024456 Carnegie-Mellon Univ., Pittsburgh, PA USA
Global Information Grid Survivability: Four Studies
Ciampa, Richard C; Day, Dawn; Franks, Jennifer R; Tsuboi, Christopher T; Mar 2007; 95 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A465913; CMU/SEI-2006-SR-008; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465913

The four studies in this document are student contributions to the SEI Global Information Grid (GIG) Survivability Study. Each study explores an issue relevant to the survivability of networks which are systems of systems. Since the GIG is inherently a system of systems the survivability of operational concepts such as Joint Battle Management Command and Control (JBMC2) will largely depend on the extent to which GIG architecture is approached from this perspective. Systems of systems differ from large monolithic systems because of the simultaneous independence and interdependence of their constituent parts and therefore traditional survivability methods are not sufficient. To deal with the operational complexity resulting from qualities peculiar to systems of systems planners and builders of the GIG will need to formulate broad strategic approaches taking these qualities into account. These four studies have attempted to identify characteristics of systems of systems which may be useful in this endeavor. The specific areas explored in this document include the following: the applicability of autonomous agents in a system of systems; the suitability of conventional software testing in a system-of-systems environment; emergent properties and unanticipated consequences in a system of systems; the role of ontologies in systems-of-systems interoperability; the architectural properties and operational survivability effects of internet protocol version 6 (IPv6) technology.
DTIC
Computer Networks; Grid Computing (Computer Networks)

20070024694 Visual Editor Consultants, Richland, WA, USA
Conversion of Input Data between KENO and MCNP File Formats for Computer Criticality Assessments (Phase 1)
Schwarz, R.; Carter, L. L.; Schwarz, A.; Nov. 2006; 14 pp.; In English
Report No.(s): DE2007-895741; DOE/ER-84178-1; No Copyright; Avail.: National Technical Information Service (NTIS)

KENO is a Monte Carlo criticality code that is maintained by Oak Ridge National Laboratory (ORNL). KENO is included in the SCALE (Standardized Computer Analysis for Licensing Evaluation) package. KENO is often used because it was specifically designed for criticality calculations. Because KENO has convenient geometry input, including the treatment of lattice arrays of materials, it is frequently used for production calculations. Monte Carlo N-Particle (MCNP) is a Monte Carlo transport code maintained by Los Alamos National Laboratory (LANL). MCNP has a powerful 3D geometry package and an extensive cross section database. It is a general-purpose code and may be used for calculations involving shielding or medical facilities, for example, but can also be used for criticality calculations. MCNP is becoming increasingly more popular for performing production criticality calculations. Both codes have their own specific advantages. After a criticality calculation has been performed with one of the codes, it is often desirable (or may be a safety requirement) to repeat the calculation with the other code to compare the important parameters using a different geometry treatment and cross section database. This

manual conversion of input files between the two codes is labor intensive. The industry needs the capability of converting geometry models between MCNP and KENO without a large investment in manpower. The proposed conversion package will aid the user in converting between the codes. It is not intended to be used as a black box. The resulting input file will need to be carefully inspected by criticality safety personnel to verify the intent of the calculation is preserved in the conversion. The purpose of this package is to help the criticality specialist in the conversion process by converting the geometry, materials, and pertinent data cards.
NTIS
Format; Neutral Particles

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20070023775 Army Tank-Automotive Research and Development Command, Warren, MI USA
Autonomous Robotic Following Using Vision Based Techniques
Kania, Robert T; Frederick, Phil A; Del Rose, Mike; Apr 18, 2006; 12 pp.; In English
Report No.(s): AD-A465875; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465875

The Intelligent Systems And Autonomous Controls (ISAAC) robot is an experimental autonomous research platform being developed to advance current dismount following applications. Specifically, vision based following using pedestrian detection. The current standard in mule applications is the following of GPS waypoints. ISAAC is designed to follow a specific person using solely vision based techniques. The core of the vision based algorithms used in this application is based on years of research from a collaboration of government and university partners. Stereo vision techniques determine a person, identify them as the leader, and map a path for autonomous following. This paper focuses on the initialization of these algorithms and the control scheme used to implement them on a real-world platform.
DTIC
Autonomy; Computer Vision; Robotics; Robots

20070023799 Science, Engineering and Technology, Arlington, VA USA
Military Robotics and Collateral Damage
Kott, Robert Douglass; lexander; Jun 2004; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A466008; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA466008

We explore a concept of a combined force of air and ground combat robots that could act in a force protection and close fire support roles for a human force. The combat robots would operate primarily in the revenge-fire mode, detecting hostile fire and returning fire in a largely autonomous fashion, rapidly and accurately. Such concepts raise important questions in terms of their impact on collateral damage. In a broader context, western warfare in general places a continuously growing emphasis on issues of collateral damage. Thus, developers of combat robots must seek means to minimize collateral damage, specifically non-combatant fatalities. Planning and control of effects produced by combat robotic force should be focused in equal measure on what is not destroyed as well as on what is destroyed. In this paper, we review emerging concepts of combat robots, propose a model for estimating the risk of non-combatant fatalities, and offer a step toward quantitative comparison of the ratio of non-combatant to combatant fatalities expected in human and robotic engagements. We argue that use of combat robots with the right rules of engagement can dramatically reduce the risk of collateral damage as compared to manned combat operations.
DTIC
Combat; Damage; Robotics; Robots; Support Systems

20070025064 NASA Johnson Space Center, Houston, TX, USA
Beyond the Prototype: The Design Evolution of a Deployed AI System
Martin, Cheryl; Schreckenghost, Debra; [2004]; 4 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS9-02060; Copyright; Avail.: Other Sources

Our previous experiences with deployed intelligent control agents for NASA advanced life support systems

(Schreckenghost et al., 2002) inspired us to develop the Distributed Collaboration and Interaction (DCI) system to help humans and mostly-autonomous software agents work together. We discovered many unaddressed needs for human interaction with control agents that operate continuously over months to years to monitor and perform process control for regenerative life support systems. These systems recover usable water or air from the waste products created by biological systems over time. Through the DCI project, we have addressed the needs for interaction between humans and autonomous control systems. This paper describes the software engineering aspects of our experiences, first, in designing and developing a prototype of the DCI system, and later, in adjusting the implementation to make the leap from initial prototype to a system ready to be applied under varying circumstances to meet different needs. The details in the paper focus primarily on the second stage of development. The DCI system is currently deployed, operating 24/7, to assist humans to interact with an advanced Water Recovery System (WRS). In addition, we have demonstrated an application of DCI to support ground personnel in mission support roles.
Derived from text
Artificial Intelligence; Prototypes; Software Engineering; Distributed Processing; Control Systems Design; Human-Computer Interface

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20070023773 California Univ., Irvine, CA USA
Capturing Sensor-Generated Time Series with Quality Guarantees
Lazaridis, Iosif; Mehrotra, Sharad; Jan 2003; 13 pp.; In English
Contract(s)/Grant(s): IIS-9996140; IIS-0-86124
Report No.(s): AD-A465863; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465863

We are interested in capturing time series generated by small wireless electronic sensors. Battery-operated sensors must avoid heavy use of their wireless radio which is a key cause of energy dissipation. When many sensors transmit, the resources of the recipient of the data are taxed; hence, limiting communication will benefit the recipient as well. In our paper we show how time series generated by sensors can be captured and stored in a database system (archive). Sensors compress time series instead of sending them in raw form. We propose an optimal on-line algorithm for constructing a piecewise constant approximation (PCA) of a time series which guarantees that the compressed representation satisfies an error bound on the L(infinity) distance. in addition to the capture task, we often want to estimate the values of a time series ahead of time, e.g., to answer real-time queries. To achieve this, sensors may fit predictive models on observed data, sending parameters of these models to the archive. We exploit the interplay between prediction and compression in a unified framework that avoids duplicating effort and leads to reduced communication.
DTIC
Detectors; Time Series Analysis

20070025054 NASA Ames Research Center, Moffett Field, CA, USA
Preliminary Evaluation of an Aviation Safety Thesaurus' Utility for Enhancing Automated Processing of Incident Reports
Barrientos, Francesca; Castle, Joseph; McIntosh, Dawn; Srivastava, Ashok; August 2007; 10 pp.; In English
Report No.(s): NASA/TM-2007-214559; Copyright; Avail.: CASI: A02, Hardcopy

This document presents a preliminary evaluation the utility of the FAA Safety Analytics Thesaurus (SAT) utility in enhancing automated document processing applications under development at NASA Ames Research Center (ARC). Current development efforts at ARC are described, including overviews of the statistical machine learning techniques that have been investigated. An analysis of opportunities for applying thesaurus knowledge to improving algorithm performance is then presented.
Author
Machine Learning; Thesauri; Aircraft Safety; Flight Safety; Statistical Analysis

20070025087 GB Technology, Inc., Houston, TX, USA, NASA Johnson Space Center, Houston, TX, USA
Analytic Guidance for the First Entry in a Skip Atmospheric Entry
Garcia-Llama, Eduardo; August 20, 2007; 18 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025087

This paper presents an analytic method to generate a reference drag trajectory for the first entry portion of a skip atmospheric entry. The drag reference, expressed as a polynomial function of the velocity, will meet the conditions necessary to fit the requirements of the complete entry phase. The generic method proposed to generate the drag reference profile is further simplified by thinking of the drag and the velocity as density and cumulative distribution functions respectively. With this notion it will be shown that the reference drag profile can be obtained by solving a linear algebraic system of equations. The resulting drag profile is flown using the feedback linearization method of differential geometric control as guidance law with the error dynamics of a second order homogeneous equation in the form of a damped oscillator. This approach was first proposed as a revisited version of the Space Shuttle Orbiter entry guidance. However, this paper will show that it can be used to fly the first entry in a skip entry trajectory. In doing so, the gains in the error dynamics will be changed at a certain point along the trajectory to improve the tracking performance.
Author
Atmospheric Entry; Space Shuttle Orbiters; Linear Systems; Distribution Functions; Trajectories; Polynomials; Drag; Density Distribution

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20070023784 Nebraska Univ., Omaha, NE USA
Bayesian-Game Modeling of C2 Decision Making in Submarine Battle-Space Situation Awareness
Hicks, Jeffrey D; Myers, Gregory; Stoyen, Alexander; Zhu, Qiuming; Mar 24, 2004; 60 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465912; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465912

In a previous paper of ours [HPSZ02], we addressed the C2 decision support issues and introduced software agent architecture for combat C2 tactical decision aids under overwhelming information inflow and uncertainty. The research described in this paper is further concentrated on applying a Bayesian-Game-theoretic approach to multi-source data fusion for achieving the situational awareness that supports C2 decision making in time and mission stressed settings with significant amount of information uncertainty and inaccuracy. The Consolidated Undersea Situational Awareness System (CUSAS) provides information management and integration by applying an evolutionary games theoretic model to state determinations and conflict resolutions in a mapping between the combat space data sets and the situational state estimations. A Bayesian probabilistic computation is conducted to evaluate sensory and environmental inputs and quantitatively rank the situational state hypotheses in terms of certainty functions. Asynchronous and intelligent agents are employed to support the prioritization, management, and coordination of the data fusion process, as well as to model adversarial and friendly behavior for providing advice to decision makers or other software agents playing human roles. The agents with data fusion ability are to learn and cooperate to process overwhelming combat information more accurately, systematically, and in a well-prioritized manner.
DTIC
Bayes Theorem; Command and Control; Decision Making; Decision Support Systems

20070023957 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
New Model for Population-Subpopulation Differences
Crosier, Ronald B; Feb 2007; 21 pp.; In English
Contract(s)/Grant(s): DE-AI01-00NN20105; Proj-01-01NN20105.001
Report No.(s): AD-A465827; ECBC-TR-534; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465827

Civil defense planning requires estimates of the toxicity of chemical warfare agents to the general public, but the current toxicity estimates are for male soldiers. In ECBC-TR-224 and ECBC-TR-337, individual susceptibilities for both the general

population and the military subpopulation were modeled by a lognormal distribution. The assumption of a lognormal distribution of individual susceptibilities for both the general population and a subpopulation cannot be correct. This report presents an alternative model and compares the previous and new models.
DTIC
Chemical Warfare; Demography; Normal Density Functions; Populations; Toxicity

20070024990 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Recommendation for Random Number Generation Using Deterministic Random Bit Generators. Computer Security
Barker, E.; Kelsey, J.; Jun. 2006; 131 pp.; In English
Report No.(s): PB2007-108489; NIST/SP-800-90; No Copyright; Avail.: CASI: A07, Hardcopy

This recommendation specifies mechanisms for the generation of random bits using deterministic methods. The methods provided are based on either hash functions, block cipher algorithms or number theoretic problems.
NTIS
Computer Information Security; Random Numbers

20070025057 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Methods for Structural Reliability and Risk
Chamis, Christos C.; July 11, 2007; 12 pp.; In English; International Conference on Advances and Trends in Engineering Materials and Their Applications (ATEMA'2007), 6-10 Aug. 2007, Montreal, Canada; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.15.03
Report No.(s): NASA/TM-2007-214703; E-15908-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025057

A formal method is described to quantify structural reliability and risk in the presence of a multitude of uncertainties. The method is based on the materials behavior level where primitive variables with their respective scatters are used to describe that behavior. Computational simulation is then used to propagate those uncertainties to the structural scale where reliability and risk are usually specified. A sample case is described to illustrate the effectiveness, versatility, and maturity of the method. Typical results from this method demonstrate that the method is mature and that it can be used for future strategic projections and planning to assure better, cheaper, faster products for competitive advantages in world markets. The results also indicate that the methods are suitable for predicting remaining life in aging or deteriorating structures.
Author
Structural Reliability; Risk; Market Research; Management Planning; Probability Theory

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20070023772 Space and Naval Warfare Systems Command, San Diego, CA USA
Integrating Usability Engineering in the Iterative Design Process of the Land Attack Combat System (LACS) Human Computer Interface (HCI)
Borja, Ana T; Jun 2004; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465860; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465860

Usability engineering are the set of design and development practices the Space & Naval Warfare Systems Center (SSC San Diego) followed in order to ensure that the Tomahawk Operators can succeed in using the Land Attack Combat Systems (LACS) for its intended purposes. This paper presents our approach of the usability engineering activities and the results from a 1-year Fiscal Year 2003 effort for the development of the LACS Human Computer Interface (HCI). Iterative usability evaluations and design processes were conducted quarterly on the LACS HCI in order to develop the HCI that best supported the tasks of the Tomahawk Operators. Usability evaluations consisted both of Heuristic Reviews and Usability Testing. Results from these iterative evaluations were integrated into successive design builds for further evaluations.
DTIC
Combat; Heuristic Methods; Human-Computer Interface

20070023778 Air Combat Command, Langley AFB, VA USA

Operationalizing Effects-Based Operations (An EBO Methodology Based on Joint Doctrine)

Williams, Reginald J; Kendall, Rocky; Jun 2004; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465890; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA465890

Adopting an effects-based approach for the conduct of military operations is central to the transformation efforts underway in America's armed forces. The effects-based approach, commonly referred to as Effects-Based Operations (EBO), is imbued with creative, critical thought processes and deliberate methodologies for planning, executing, and assessing operations that are designed to create the specific effects necessary to achieve national security objectives. It exploits lethal and non-lethal applications of force and applies to the full spectrum of missions from humanitarian relief to major combat operations. Moreover, it is applicable at all levels of decision-making; strategic, operational and tactical. EBO allows military planners to avoid attrition and apply force at the right place and time to achieve specific effects. It redirects the focus of every action toward attaining the desired national security outcome rather than on the inputs to a force on force engagement, which is merely one of many alternative solutions. EBO optimally integrates all the elements of national power diplomatic, economic, military, and information in the planning and execution process and is as concerned with the state of the peace following military action as it is with victory itself. The war is not won until the desired political outcomes are achieved.

DTIC

Decision Theory; Military Operations; Planning

20070024471 Ministry of Defence, London, UK

Agile Command Capability: Future Command in the Joint Battlespace and its Implications for Capability Development

Bewick, David J; Harland, Steven J; Jun 2004; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A465893; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA465893

This briefing discusses the Ministry of Defence requirements for Future Command within the context of the UK's Joint Higher Level Operational Concept (HLOC). The analysis is set within the context of prior and current work on Effects Based Operations (EBO), the capability components of 'Command,'Inform' and Operate within HLOC, and technologies associated with Network Enabled Capability.

DTIC

Command and Control; Military Technology; Systems Analysis; Operations Research

20070025100 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Advancing the practice of systems engineering at JPL

Jansma, Patti A.; Jones, Ross M.; March 4, 2006; 19 pp.; In English; IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; Original contains black and white illustrations

Report No.(s): IEEE Paper 1031, Version 6; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40111

In FY 2004, JPL launched an initiative to improve the way it practices systems engineering. The Lab's senior management formed the Systems Engineering Advancement (SEA) Project in order to 'significantly advance the practice and organizational capabilities of systems engineering at JPL on flight projects and ground support tasks.' The scope of the SEA Project includes the systems engineering work performed in all three dimensions of a program, project, or task: 1. the full life-cycle, i.e., concept through end of operations 2. the full depth, i.e., Program, Project, System, Subsystem, Element (SE Levels 1 to 5) 3. the full technical scope, e.g., the flight, ground and launch systems, avionics, power, propulsion, telecommunications, thermal, etc. The initial focus of their efforts defined the following basic systems engineering functions at JPL: systems architecture, requirements management, interface definition, technical resource management, system design and analysis, system verification and validation, risk management, technical peer reviews, design process management and systems engineering task management, They also developed a list of highly valued personal behaviors of systems engineers, and are working to inculcate those behaviors into members of their systems engineering community. The SEA Project is developing products, services, and training to support managers and practitioners throughout the entire system lifecycle. As these are developed, each one needs to be systematically deployed. Hence, the SEA Project developed a deployment process that includes four aspects: infrastructure and operations, communication and outreach, education and training, and consulting support. In addition, the SEA Project has taken a proactive approach to organizational change management and customer relationship management - both concepts and approaches not usually invoked in an engineering environment. This paper'3

describes JPL's approach to advancing the practice of systems engineering at the Lab. It describes the general approach used and how they addressed the three key aspects of change: people, process and technology. It highlights a list of highly valued personal behaviors of systems engineers, discusses the various products, services and training that were developed, describes the deployment approach used, and concludes with several lessons learned.
Author
Engineering Management; Systems Engineering; Avionics; Systems Analysis; Telecommunication; Project Management

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20070023786 Mitre Corp., Bedford, MA USA
The Spreading and Overlay Codes for the L1C Signal
Rushanan, Joseph J; Mar 2007; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-04-C-0001
Report No.(s): AD-A465929; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465929

The creation of the new L1C GPS signal presented the opportunity to choose both a family of spreading codes and an associated family of overlay codes. This paper describes the rationale and construction of these families. The families were created from extensive searches with each search requiring its own fine-tuned techniques and search criteria. The L1C spreading codes comprise 210 pilot/data pairs of length-10230 sequences. The data code modulates the data message bits while the pilot code modulates the overlay code symbols, which represents a fixed repeating pattern. The codes are perfectly balanced and exhibit good auto- and cross-correlation (both in the 'odd' case, when there is a bit transition across the code boundary, and the 'even' case when there is no such transition). The length 10230 precluded the immediate adaptation of well-known spreading code families, such as Gold codes. Instead, the relatively new Weil sequence construction was adapted. Weil codes are prime length sequences constructed via shift-and-add from the well-known Legendre sequence and one of its shifts. Weil code correlation sidelobes are bounded by twice the square root of the length, which is no worse than 3 dB from commonly used Gold codes.
DTIC
Global Positioning System; Signal Processing; Spreading

20070024662 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Phenomenological Studies of Double Charged Pion Electroproduction from the CLAS data
Mokeev, V.; Burkert, V.; Oct. 2006; 4 pp.; In English
Report No.(s): DE2007-896984; No Copyright; Avail.: National Technical Information Service (NTIS)

Recent results from phenomenological studies of the CLAS data on 2 (pi) electroproduction off proton are presented. The analysis is focused on extracting of N (yields) N* electromagnetic transition amplitudes from the full data set on unpolarized 1-differential 2 (pi) cross-sections.
NTIS
Pions; Protons; Scattering Cross Sections

20070024663 Argonne National Lab., IL USA, Fermi National Accelerator Lab., Batavia, IL, USA, IIT Research Inst., Chicago, IL, USA
Interactions of Surface Damage and RF Cavity Operation
Norem, J.; Hassanein, A.; Moretti, A.; Torun, Y.; Qian, Z.; January 2006; 3 pp.; In English
Report No.(s): DE2007-897176; FERMILAB-CONF-06-338-AD; No Copyright; Avail.: Department of Energy Information Bridge

Studies of low frequency RF systems for muon cooling has led to a variety of new techniques for looking at dark currents, a new model of breakdown, and, ultimately, a model of RF cavity operation based on surface damage. We find that cavity behavior is strongly influenced by the spectrum of enhancement factors on field emission sites. Three different spectra are involved: one defining the initial state of the cavity, the second determined by the breakdown events, and the third defining

the equilibrium produced as a cavity operates at its maximum field. We have been able to measure these functions and use them to derive a wide variety of cavity parameters: conditioning behavior, material, pulse length, temperature, vacuum, magnetic field, pressure, gas dependence. In addition we can calculate the dependence of breakdown rate on surface field and pulse length. This work correlates with data from Atom Probe Tomography. We will describe this model and new experimental data.
NTIS
Cavities; Damage; Radio Frequencies; Mathematical Models; Muons

20070024666 Fermi National Accelerator Lab., Batavia, IL, USA, Udine Univ., Italy
Optimization of the BCP Processing of Elliptical NB SRF Cavities
Boffo, C.; Cooper, C.; Rowe, A.; Galasso, G.; January 2006; 3 pp.; In English
Report No.(s): DE2007-897244; FERMILAB-CONF-06-181TD; No Copyright; Avail.: National Technical Information Service (NTIS)

At present, the electropolishing (EP) process is considered the key technology unleashing the capability to produce Niobium SRF cavities performing at or above 35 MV/m. Nevertheless buffered chemical polishing (BCP) remains a cheap, simple and effective processing technique for single grain high gradient and polycrystalline lower gradient cavities. BCP will be adopted to chemically process the third harmonic 3.9 GHz cavities being fabricated at Fermilab (1). The dimensions and the shape of these cavities yield a strong nonuniformity in the material removal between iris and equator of the cells. This paper describes the thermal-fluid finite element model adopted to simulate the process, the experimental flow visualization tests performed to verify the simulation and a novel device fabricated to solve the problem.
NTIS
Cavities; Electropolishing; Niobium; Finite Element Method

20070024676 Lawrence Livermore National Lab., Livermore, CA USA
High Efficiency Germanium Immersion Gratings
Kuzmenko, P. J.; Davis, P. J.; Little, S. L.; Little, L. M.; Bixler, J. V.; May 05, 2006; 16 pp.; In English
Report No.(s): DE2007-899391; UCRL-CONF-221103; No Copyright; Avail.: National Technical Information Service (NTIS)

We have fabricated several germanium immersion gratings by single crystal, single point diamond flycutting on an ultraprecision lathe. Use of a dead sharp tool produces groove corners less than 0.1 micron in radius and consequently high diffraction efficiency. We measured first order efficiencies in immersion of over 80% at 10.6 micron wavelength. Wavefront error was low averaging 0.06 wave rms (at 633 nm) across the full aperture. The grating spectral response was free of ghosts down to our detection limit of 1 part in 104. Scatter should be low based upon the surface roughness. Measurement of the spectral line profile of a CO2 laser sets an upper bound on total integrated scatter of 0.5%.
NTIS
Germanium; Gratings (Spectra); Submerging

20070024678 Lawrence Livermore National Lab., Livermore, CA USA
Modeling the QCD Equation of State in Relativistic Heavy Ion Collisions on BlueGene/L
Soltz, R.; Grady, J.; Hartouni, E. P.; Gupta, R.; Vitev, I.; Apr. 10, 2006; 20 pp.; In English
Report No.(s): DE2007-897923; UCRL-TR-220486; No Copyright; Avail.: Department of Energy Information Bridge

On 9,10 Feb 2006 a workshop was held at LLNL to discuss how a 10% allocation of the ASC BG/L supercomputer performing a finite temperature Lattice QCD (LQCD) calculation of the equation of state and non-equilibrium properties of the quark-gluon state of matter could lead to a breakthrough in our understanding of recent data from the Relativistic Heavy Ion Collider at Brookhaven National Lab. From this meeting and subsequent discussions we present a detailed plan for this calculation, including mechanisms for working in a secure computing environment and inserting the resulting equation of state into hydrodynamic transport models that will be compared directly to the RHIC data. We discuss expected benefits for DOE Office of Science research programs within the context of the NNSA mission.
NTIS
Equations of State; Heavy Ions; Ionic Collisions; Quantum Chromodynamics

20070024681 New Hampshire Univ., Durham, NH, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

Recent Results from N* Electroproduction Studies with CLAS

Egiyan, H.; Nov. 2006; 3 pp.; In English

Report No.(s): DE2007-896488; DOE/OR-23177-0016; No Copyright; Avail.: Department of Energy Information Bridge

During the last eight years a large amount of data on single and two pion electroproduction have been collected using the CEBAF Large Acceptance Spectrometer (CLAS) at Jefferson Lab. The large kinematical coverage of the detector allowed us to perform isobar model fits to extract the transition form factors for the excited states in the second and third resonance regions. The preliminary results for the photocoupling amplitudes from these analyses were presented in this report.

NTIS

Pions; Spectrometers; Particle Production

20070024684 Lawrence Livermore National Lab., Livermore, CA USA

Noise Studies of Externally Dispersed Interferometry for Doppler Velocimetry

Erskine, D. J.; Edelstein, J.; Lloyd, J.; Muirhead, P.; May 11, 2006; 12 pp.; In English

Report No.(s): DE2007-899407; UCRL-PROC-221332; No Copyright; Avail.: Department of Energy Information Bridge

Externally Dispersed Interferometry (EDI) is the series combination of a fixed-delay field-widened Michelson interferometer with a dispersive spectrograph. This combination boosts the spectrograph performance for both Doppler velocimetry and high resolution spectroscopy. The interferometer creates a periodic comb that multiplies against the input spectrum to create moire fringes, which are recorded in combination with the regular spectrum. Both regular and high-frequency spectral components can be recovered from the data the moire component carries additional information that increases the signal to noise for velocimetry and spectroscopy. Here we present simulations and theoretical studies of the photon limited Doppler velocity noise in an EDI. We used a model spectrum of a 1600K temperature star. For several rotational blurring velocities 0, 7.5, 15 and 25 km/s we calculated the dimensionless Doppler quality index (Q) versus wavenumber v. This is the normalized RMS of the derivative of the spectrum and is proporotional to the photon-limited Doppler signal to noise ratio.

NTIS

Doppler Effect; Interferometry; Velocity Measurement; Noise (Sound)

20070024688 Lawrence Livermore National Lab., Livermore, CA USA

Analysis of the January 2006 Pepper-Pot Experiments

Westenskow, G.; Chambers, F.; Bieniosek, F.; Henestroza, E.; Apr. 03, 2006; 31 pp.; In English

Report No.(s): DE2007-899416; UCRL-TR-220340; No Copyright; Avail.: National Technical Information Service (NTIS)

Between January 9-12, 2006 a series of experiments were performed on the DARHT-II injector to measure the beams emittance. Part of these experiments were pepper-pot measurements. This note describes the analysis of the data, and our conclusions from the experiments. The experiments were done just after the BCUZ section. It shows the layout near the pepper-pot hardware. We used a beam energy of 2.6 MeV in the calculations based on diode voltage measurements. Subsequent energy spectrometer measurements indicated a beam energy of 2.45 MeV. This discrepancy (8%) impacts directly the numbers reported below for the normalized emittance.

NTIS

Emittance; Linear Accelerators; Electron Beams

20070024696 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA, Temple Univ., Philadelphia, PA, USA

Quark-Gluon Correlations and Color Polarizabilities

Meziani, Z. E.; Nov. 2006; 5 pp.; In English

Report No.(s): DE2007-896485; JLAB/THY-06-596; No Copyright; Avail.: National Technical Information Service (NTIS)

The author discusses the present status of the twist-3 matrix element in the spin structure of the nucleon and describe two proposed experiments that will improve on the precision of the present measurements of the twist-3 and twist-4 matrix elements for both the proton and the neutron and consequently will improve on our knowledge of the color polarizabilitites in the nucleon.

NTIS

Color; Correlation; Gluons; Polarization Characteristics

20070024727 New Mexico State Univ., Las Cruces, NM, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

Strange Quark Contribution to the Proton Spin, from Elastic $/vecep$ and $nu p$ Scattering

Pate, S.; Oct. 2006; 4 pp.; In English

Report No.(s): DE2007-899230; JLAB-PHY-06-609; No Copyright; Avail.: Department of Energy Information Bridge

The strangeness contribution to the vector and axial form factors of the proton is presented for momentum transfers in the range 0.45 < Q2 < 1.0 GeV2. The results are obtained via a combined analysis of forward-scattering parity-violating elastic (approximately) ep asymmetry data from the G0 and HAPPEx experiments at Jefferson Lab, and elastic n p and n p scattering data from Experiment 734 at Brookhaven National Laboratory. The combination of the two data sets allows for the simultaneous extraction of Gs E, Gs M, and Gs A over a significant range of Q2 for the very first time. Determination of the strange axial form factor Gs A is vital to an understanding of the strange quark contribution to the proton spin.

NTIS

Form Factors; Protons; Quarks; Scattering; Momentum Transfer

20070024729 Stanford Linear Accelerator Center, CA, USA, Bari Univ., Italy

Charm and Charmonium Spectroscopy from B-Factories (SLAC-PUB-12344)

Palano, A.; Jun. 2006; 8 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-899211; SLAC-PUB-12344; No Copyright; Avail.: National Technical Information Service (NTIS)

New and recent results are presented on charm and charmonium spectroscopy from BABAR experiment at SLAC. In particular, measurements on DsJ states branching fractions have been performed both in B-decays and inclusive e+e- . cc interactions. Here a search for Dsj(2632) has been performed and a new DsJ state at a mass of 2.856 GeV/c2 has been observed. A search for Y (4260) has been performed in exclusive D D production from initial-state radiation.

NTIS

Charm (Particle Physics); Mesons; Spectroscopy

20070024735 Cooley, Godward, LLP, Palo Alto, CA, USA

Apparatus, System, and Method for High Flux, Compact Compton X-Ray Source

Rikin, J., Inventor; Loewen, R. J., Inventor; Ruth, R. D., Inventor; 9 Mar 05; 19 pp.; In English

Contract(s)/Grant(s): R44GM06651102

Patent Info.: Filed Filed 9 Mar 05; US-Patent-Appl-SN-11-077 524

Report No.(s): PB2007-105899; No Copyright; Avail.: CASI: A03, Hardcopy

A Compton backscattering x-ray source includes an electron storage ring for storing electron bunches. A timing system refreshes an orbiting electron bunch according to a schedule selected to improve at least one attribute of x-ray emission. In one implementation, the electron bunch is periodically refreshed with a period of at least about 10 Hz.

NTIS

X Ray Sources; Backscattering

20070024737 Cohen, Sakaguchi and English, LLP, Irvine, CA, USA

Method and Apparatus for Quantification of Optical Properties of Superficial Volumes

Durkin, A. J., Inventor; Tseng, S. H., Inventor; 12 Apr 05; 24 pp.; In English

Contract(s)/Grant(s): RR01192

Patent Info.: Filed Filed 12 Apr 05; US-Patent-Appl-SN-11-104 033

Report No.(s): PB2007-105898; No Copyright; Avail.: CASI: A03, Hardcopy

A device and method for accurately performing quantitative diffuse optical spectroscopy on a sample includes a light source and a source optical fiber that is optically coupled to the light source. A diffuser material is interposed between the source optical fiber and the sample, the diffuser material comprising a high scattering, low absorption material. The diffuser material effectively increases the photon path length from the light source to the sample, which limits the depth of interrogation to superficial volumes despite the penetrating nature of the radiation typically used. A detector optical fiber is provided adjacent to or laterally disposed from the source optical fiber. The detector optical fiber is coupled to a detector which detects

photons collected in the detector optical fiber. The detector optical fiber and the source optical fiber may be separated by a distance of less than 5 mm while still permitting the diffusion approximation to remain valid.
NTIS
Optical Properties; Spectroscopy; Methodology

20070024741 Texas Univ. System, Austin, TX, USA, Massachusetts Inst. of Tech., Cambridge, MA, USA
Multifunctional Biomaterials as Scaffolds for Electronic, Optical, Magnetic, Semiconducting, and Biotechnological Applications
Belcher, A. M., Inventor; Peelle, B. R., Inventor; Nam, K. T., Inventor; 15 Oct 04; 30 pp.; In English
Contract(s)/Grant(s): DAAD-19-02-D-0002
Patent Info.: Filed Filed 15 Oct 04; US-Patent-Appl-SN-10-965-227
Report No.(s): PB2007-104226; No Copyright; Avail.: CASI: A03, Hardcopy

One-dimensional ring structures form M13 viruses were constructed by two genetic modifications encoding binding peptides and synthesis of a heterobifunctional linker molecule. The bifunctional viruses displayed an anti-streptavidin peptide and hexahistidine (SEO ID NO: 4) peptide at opposite ends of the virus as pIII and pIX fusions. Stoichiometic addition of the streptavidin-NiNTA linker molecule led to the reversible formation of virus-based nanorings with circumferences corresponding to lengths of the packagable DNAs. These virus-based ring structures can be further engineered to nucleate inorganic materials and form metallic, magnetic, or semiconductor nanorings using trifunctionalized viruses.
NTIS
Genetic Engineering; Patent Applications; Viruses

20070024744 Battelle Columbus Labs., OH USA
Composite Solid-State Scintillators for Neutron Detection
Dai, S., Inventor; Im, H. J., Inventor; Pawel, M. D., Inventor; 7 Apr 04; 10 pp.; In English
Patent Info.: Filed Filed 7 Apr 04; US-Patent-Appl-SN-10-819 761
Report No.(s): PB2007-105880; No Copyright; Avail.: CASI: A02, Hardcopy

Applicant's present invention is a composite scintillator for neutron detection comprising a matrix material fabricated from an inorganic sol-gel precursor solution homogeneously doped with a liquid scintillating material and a neutron absorbing material. The neutron absorbing material yields at least one of an electron, a proton, a triton, an alpha particle or a fission fragment when the neutron absorbing material absorbs a neutron. The composite scintillator further comprises a liquid scintillating material in a self-assembled micelle formation homogeneously doped in the matrix material through the formation of surfactant-silica composites. The scintillating material is provided to scintillate when traversed by at least one of an electron, a proton, a triton, an alpha particle or a fission fragment. The scintillating material is configured such that the matrix material surrounds the micelle formation of the scintillating material. The composite scintillator is fabricated and applied as a thin film on substrate surfaces, a coating on optical fibers or as a glass material.
NTIS
Detection; Neutrons; Solid State; Scintillation

20070024745 Bockhop (Bryan W.), Esq., Snellville, GA, USA
Large Scale Patterned Growth of Aligned One-Dimensional Nanostructures
Wang, Z. L., Inventor; Summers, C. J., Inventor; Wang, X., Inventor; Graugnard, E. D., Inventor; King, J., Inventor; 10 Dec 04; 16 pp.; In English
Contract(s)/Grant(s): MR9733160; DAAD19010603
Patent Info.: Filed Filed 10 Dec 04; US-Patent-Appl-SN-11-010 178
Report No.(s): PB2007-105878; No Copyright; Avail.: CASI: A03, Hardcopy

A method of making nanostructures using a self-assembled monolayer of organic spheres is disclosed. The nanostructures include bowl-shaped structures and patterned elongated nanostructures. A bowl-shaped nanostructure with a nanorod grown from a conductive substrate through the bowl-shaped nanostructure may be configured as a field emitter or a vertical field effect transistor. A method of separating nanoparticles of a desired size employs an array of bowl-shaped structures.
NTIS
Nanostructures (Devices); Spheres; Self Assembly

20070024748 Stanford Linear Accelerator Center, CA, USA
Simulator for the Linear Collider (SLIC): A Tool for ILC Detector Simulations
Graf, N.; McCormick, J.; January 2007; 10 pp.; In English
Report No.(s): DE2007-899570; SLAC-PUB-12350; No Copyright; Avail.: Department of Energy Information Bridge

The Simulator for the Linear Collider (SLIC) is a detector simulation program based on the GEANT4 toolkit. It is intended to enable end users to easily model detector concepts by providing the ability to fully describe detectors using plain text files read in by a common executable at runtime. The detector geometry, typically the most complex part of a detector simulation, is described at runtime using the Linear Collider Detector Description (LCDD). This system allows end users to create complex detector geometries in a standard XML format rather than procedural code such as C++. The LCDD system is based on the Geometry Description Markup Language (GDML) from the LHC Applications Group (LCG). The geometry system facilitates the study of different full detector design and their variations. SLIC uses the StdHep format to read input created by event generators and outputs events in the Linear Collider IO (LCIO) format. The SLIC package provides a binding to GEANT4 and many additional commands and features for the end user.
NTIS
Computerized Simulation; Simulation; Simulators

20070024761 Lawrence Livermore National Lab., Livermore, CA USA
Sampling the Number of Neutrons Emitted per Fission
Cullen, D. E.; Jun. 30, 2006; 19 pp.; In English
Report No.(s): DE2007-897928; UCRL-TR-222526; No Copyright; Avail.: National Technical Information Service (NTIS)

The author defines in detail the model used to sample the number of prompt neutrons emitted in fission; this description is based on publications defining the model (1) as well as publications comparing the model to experimental measurements (2). The model described in these publications is exactly what the TART (3) Monte Carlo transport code uses. Based on comparisons between TART (3) and MCNPX (4), it is obvious that at the time this report was published these two computer codes are not using the same model, and the results significantly differ. It is my hope that this report will contribute toward better understanding of this model, and hopefully eventually to agreement between TART and MCNPX results. Partial success has already been achieved in the sense that based upon reading a preliminary version of this report, John Hendrichs (5), one author of MCNPX, acknowledged that the sources of differences as described in this report demonstrate an error in MCNPX (John even offered me the traditional $20 reward for reporting an error in MCNPX; I declined to accept). John is presently updating MCNPX to eliminate these sources of differences; hopefully in the not too distant future this correction will be available in MCNPX, and we will obtain agreement between TART and MCNPX, which is the ultimate objective of this report.
NTIS
Emittance; Fission; Neutrons; Sampling

20070024762 Lawrence Livermore National Lab., Livermore, CA USA
7Be(p,gamma)8B S-factor from Ab Initio Wave Functions
Navratil, P.; Bertulani, C. A.; Caurier, E.; Oct. 16, 2006; 10 pp.; In English
Report No.(s): DE2007-897929; UCRL-PROC-225329; No Copyright; Avail.: National Technical Information Service (NTIS)

There has been a significant progress in ab initio approaches to the structure of light nuclei. Starting from realistic two- and three-nucleon interactions the ab initio no-core shell model (NCSM) predicts low-lying levels in p-shell nuclei. It is a challenging task to extend ab initio methods to describe nuclear reactions. We present here a brief overview of the first steps taken toward nuclear reaction applications. In particular, we discuss our calculation of the (sup 7)Be(p,(gamma))(sup 8)B S-factor. They also present their first results of the (sup 3)He((alpha),(gamma))(sup 7)Be S-factor and of the S-factor of the mirror reaction (sup 3)H((alpha),(gamma))(sup 7)Li. The (sup 7)Be(p,(gamma))(sup 8)B and (sup 3)He((alpha),(gamma))(sup 7)Be reactions correspond to the most important uncertainties in solar model predictions of neutrino fluxes.
NTIS
Wave Functions; Nucleons

20070024764 Lawrence Livermore National Lab., Livermore, CA USA
MECRCURY vs.TART Comparisons to Verify Thermal Scattering
Cullen, D. F.; McKinley, S.; Hagmann, C.; Apr. 01, 2006; 26 pp.; In English
Report No.(s): DE2007-899422; UCRL-TR-220432; No Copyright; Avail.: National Technical Information Service (NTIS)

Recently the results from many Monte Carlo codes were compared for a series of theoretical pin-cells; the results are

documented in ref. (3); details are also provided here in Appendix A and B. The purpose of this earlier code comparison was primarily to determine how accurately our codes model both bound and free atom neutron thermal scattering. Prior to this study many people assumed that our Monte Carlo transport codes were all now so accurate that they would all produce more or less the same answers, say for example K-eff to within 0.1%. The results demonstrated that in reality we see a rather large spread in the results for even simple scalar parameters, such as K-eff, where we found differences in excess of 2%, far exceeding many people's expectations. The differences between code results were traced to four major factors, (1) Differences between the sets of nuclear data used. (2) The accuracy of nuclear data processing codes. (3) The accuracy of the models used in our Monte Carlo transport codes. (4) Code user selected input options. Naturally at Livermore we would like to insure that we minimize the effects of these factors. In this report we compare the results using two of our Monte Carlo transport codes: MERCURY (2) and TART (2), with the following constraints designed to address the four points listed above.
NTIS
Computer Programs; Neutrons; Scattering; Thermodynamic Properties

20070024765 Lawrence Livermore National Lab., Livermore, CA USA
Experimental Determination of Drag Coefficients in Low-Density Polyurethane Foam
Adams, M. L.; Apr. 20, 2006; 53 pp.; In English
Report No.(s): DE2007-899423; UCRL-TR-220737; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we consider the deceleration of metal projectiles penetrating low-density polyurethane foams. From a theoretical perspective based on Prandtl's work, although a boundary layer must exist, performing theoretical drag calculations using a no-slip boundary condition at the projectile surface and assuming the boundary layer merges into an inviscid continuum is questionable at best. From an experimental perspective based on the Wright Brother's work, performing wind tunnel tests would require the design of scaled experiments that include solid material properties. Since these problems are worthy of their own study and appear to be one step removed from the current objective, we will simply conduct experiments that passively measure the change in velocity as a projectile penetrates a foam target.
NTIS
Aerodynamic Coefficients; Aerodynamic Drag; Drag; Polyurethane Foam; Polyurethane Resins; Projectiles

20070024778 Lawrence Livermore National Lab., Livermore, CA USA
Flash X-Ray (FXR) Linear Induction Accelerator (LIA) Optimization. Sensor Delay Correction
Ong, M. M.; Houck, T. L.; Kreitzer, B. R.; Paris, R. D.; Vogtlin, G. E.; Apr. 2006; 19 pp.; In English
Report No.(s): DE2007-899421; UCRL-TR-223183; No Copyright; Avail.: National Technical Information Service (NTIS)

The radiographic goal of the FXR Optimization Project is to generate an x-ray pulse with peak energy of 19 MeV, spot-size of 1.5 mm, a dose of 500 rad, and duration of 60 ns. The electrical objectives are to generate a 3 kA electron-beam and refine our 16 MV accelerator so that the voltage does not vary more than 1%-rms. In a multi-cell linear induction accelerator, like FXR, the timing of the acceleration pulses relative to the beam is critical. The pulses must be timed optimally so that a cell is at full voltage before the beam arrives and does not drop until the beam passes. In order to stay within the energy-variation budget, the synchronization between the cells and beam arrival must be controlled to a couple of nanoseconds. Therefore, temporal measurements must be accurate to a fraction of a nanosecond. FXR Optimization Project developed a one-giga-sample per second (gs/s) data acquisition system to record beam sensor data. Signal processing algorithms were written to determine cell timing with an uncertainty of a fraction of a nanosecond. However, the uncertainty in the sensor delay was still a few nanoseconds. This error had to be reduced if we are to improve the quality of the electron beam.
NTIS
Linear Accelerators; Radiography; X Rays

20070024820 Lawrence Livermore National Lab., Livermore, CA USA
Ultrahigh Energy Resolution Gamma-ray Spectrometers for Precision Measurements of Uranium Enrichment
Ali, S.; Hau, I. D.; Niedemayr, T. R.; Friedrich, S.; Jun. 09, 2006; 17 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898508; UCRL-PROC-223838; No Copyright; Avail.: Department of Energy Information Bridge

Superconducting Gamma-ray detectors offer an order of magnitude higher energy resolution than conventional high-purity germanium detectors. This can significantly increase the precision of non-destructive isotope analysis for nuclear samples where line overlap affects the errors of the measurement. We have developed Gamma-detectors based on

superconducting molybdenum-copper sensors and bulk tin absorbers for nuclear science and national security applications. They have, depending on design, an energy resolution between (approx)50 and (approx)150 eV FWHM at (approx)100 keV. Here we apply this detector technology to the measurement of uranium isotope ratios, and discuss the trade-offs between energy resolution and quantum efficiency involved in detector design.
NTIS
Gamma Ray Spectrometers; Uranium; Isotope Ratios; Isotope Separation

20070024823 Argonne National Lab., IL USA
IPNS Progress Report 2001-2006
Marzec, B.; Nov. 27, 2006; 225 pp.; In English
Contract(s)/Grant(s): DE-AC02-06CH11357
Report No.(s): DE2007-898526; ANL-06/54; No Copyright; Avail.: National Technical Information Service (NTIS)

For this report, authors were asked to prepare articles that highlighted recent scientific accomplishments at IPNS, from 2001 to present; to focus on and illustrate the scientific advances achieved through the unique capabilities of neutron studies performed by IPNS users; to report on specific activities or results from an instrument; or to focus on a body of work encompassing different neutron-scattering techniques. Articles are also included on the accelerator system, instrumentation, computing, target, and moderators.
NTIS
Neutron Sources; Neutrons

20070024829 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Department of Energy, Washington, DC, USA
Experimental Status of Exotic Mesons and the GlueX Experiment
Carman, D. S.; Oct. 22, 2006; 10 pp.; In English
Contract(s)/Grant(s): AC05-84ER40150
Report No.(s): DE2007-898781; JLAB-PHY-06-615; DOE/ER/40150-4155; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the unanswered and most fundamental questions in physics regards the nature of the confinement mechanism of quarks and gluons in QCD. Exotic hybrid mesons manifest gluonic degrees of freedom and their spectroscopy will provide the data necessary to test assumptions in lattice QCD and the specific phenomenology leading to confinement. Within the past two decades a number of experiments have put forth tantalizing evidence for the existence of exotic hybrid mesons in the mass range below 2 GeV. This talk represents an overview of the available data and what has been learned. In looking toward the future, the GlueX experiment at Jefferson Laboratory represents a new initiative that will perform detailed spectroscopy of the light-quark meson spectrum. This experiment and its capabilities will be reviewed.
NTIS
Confinement; Gluons; Mesons; Quarks

20070024832 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Department of Energy, Washington, DC, USA
New Measurements of the EMC Effect in Few-Body Nuclei
Arrington, J.; Oct. 22, 2006; 9 pp.; In English
Contract(s)/Grant(s): AC05-84ER40150
Report No.(s): DE2007-898788; JLAB-PHY-06-607; DOE/ER/40150-4156,NUCL-EX/0701017; No Copyright; Avail.: National Technical Information Service (NTIS)

Measurements of the EMC effect show that the quark distributions in nuclei are not simply the sum of the quark distributions of the constituent nucleons. However, interpretation of the EMC effect is limited by the lack of a reliable baseline calculation of the effects of Fermi motion and nucleon binding. We present preliminary results from JLab experiment E03-103, a precise measurement of the EMC effect in few-body and heavy nuclei. These data emphasize the large-x region, where binding and Fermi motion effects dominate, and thus will provide much better constraints on the effects of binding. These data will also allow for comparisons to calculations for few-body nuclei, where the uncertainty in the nuclear structure is minimized.
NTIS
Electromagnetic Compatibility; Heavy Nuclei

20070024836 Kirsch (Alan D.), Idaho Falls, ID, USA
Ultra High Frequency Imaging Acoustic Microscope
Deason, V. A., Inventor; Telschow, K. L., Inventor; 6 Jun 05; 14 pp.; In English
Contract(s)/Grant(s): DEAC0799103727; DEAC07051014537
Patent Info.: Filed Filed 6 Jun 05; US-Patent-Appl-SN-11-146 576
Report No.(s): PB2007-105866; No Copyright; Avail.: CASI: A03, Hardcopy

An imaging system includes: an object wavefront source and an optical microscope objective all positioned to direct an object wavefront onto an area of a vibrating subject surface encompassed by a field of view of the microscope objective, and to direct a modulated object wavefront reflected from the encompassed surface area through a photorefractive material; and a reference wavefront source and at least one phase modulator all positioned to direct a reference wavefront through the phase modulator and to direct a modulated reference wavefront from the phase modulator through the photorefractive material to interfere with the modulated object wavefront. The photorefractive material has a composition and a position such that interference of the modulated object wavefront and modulated reference wavefront occurs within the photorefractive material, providing a full-field, real-time image signal of the encompassed surface area.
NTIS
Acoustic Microscopes; High Frequencies; Imaging Techniques; Wave Fronts

20070024856 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Department of Energy, Washington, DC, USA
Rich Detector at Jefferson Lab, Design, Performance and Physics Results
Cisbani, E.; Colilli, S.; Cusanno, F.; Frullani, S.; Gricia, M.; Apr. 01, 2006; 6 pp.; In English
Contract(s)/Grant(s): AC05-84ER40150
Report No.(s): DE2007-898819; JLAB-PHY-05-485; DOE/ER/40150-4158; No Copyright; Avail.: National Technical Information Service (NTIS)

Since 2004 the hadron spectrometer of Hall A at Jefferson Lab is equipped with a proximity focusing RICH. This detector is capable of identify kaon from pion and proton with a angular separation starting from 6 sigma at 2 GeV/c. The RICH design is conceptually similar to the ALICE HMPID RICH; it uses a C6F14 liquid radiator and a 300 nm layer of CsI deposited on the cathode pad plane of an asymetric MWPC. The RICH has operated for the Hypernuclear Spectroscopy Experiment E94-107, which took data in the last two years. Design details and performance along with first physics results from the hypernuclear experiment are shortly presented.
NTIS
Kaons; Focusing; Protons

20070024873 Lawrence Livermore National Lab., Livermore, CA USA
Translated ENDF Formatted Data at LLNL
Brown, D. A.; Beck, B.; Hedstrom, G.; Pruet, J.; Jul. 03, 2006; 24 pp.; In English
Report No.(s): DE2007-897933; UCRL-TR-222551; No Copyright; Avail.: Department of Energy Information Bridge

The LLNL Computational Nuclear Physics (CNP) Group announces the release of translated ENDF/BVI, ENDF/B-VII, JEFF-3.1, JENDL-3.3 and other neutron incident evaluated reaction data libraries to LLNL users.
NTIS
Data Acquisition; Mathematical Models

20070024924 Lawrence Livermore National Lab., Livermore, CA USA, Stockholm Univ., Sweden
Electromagnetic Confined Plasma Target for Interaction Studies with Intense Laser Fields
Ziebadger, B.; Ursescu, U.; Trotsenko, S.; Spillrnann, U.; Schuch, R.; Aug. 17, 2006; 17 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898496; UCRL-CONF-223792; No Copyright; Avail.: National Technical Information Service (NTIS)

The paper describes a novel application of an electron beam ion trap as a plasma target facility for intense laser-plasma interaction studies. The low density plasma target ((approx)10(sup 13)/cm(sup 3)) is confined in a mobile cryogenic electromagnetic charged particle trap, with the magnetic confinement field of 1-3T maintained by a superconducting magnet. Ion plasmas for a large variety of ion species and charge states are produced and maintained within the magnetic field and the space charge of an energetic electron beam in the 'Electron Beam Ion Trap' (EBIT) geometry. Intense laser beams (optical

lasers, x-ray lasers and upcoming 'X-Ray Free Electron Lasers' (XFEL)) provide strong time varying electromagnetic fields (>10(sup 12) V/cm in femto- to nano-sec pulses) for interactions with electromagnetically confined neutral/non-neutral plasmas. The experiments are aimed to gain understanding of the effects of intense photon fields on ionization/excitation processes, the ionization balance, as well as photon polarization effects. First experimental scenarios and tests with an intense laser that utilize the ion plasma target are outlined.
NTIS
Charged Particles; Confinement; Electromagnetic Fields; Electromagnetic Interactions; Electron Beams; Laser Outputs; Plasma Control; Plasmas (Physics); Targets

20070024927 Lawrence Livermore National Lab., Livermore, CA USA, Department of Energy, Washington, DC, USA, Defense Nuclear Agency, Washington, DC, USA
Modeled Neutron and Charged-Particle Induced Nuclear Reaction Cross Sections for Radiochemistry in the Region of Yttrium, Zirconium, Niobium, and Molybdenum
Hoffman, R. D.; Kelley, K.; Dietrich, F. S.; Bauer, R.; Mustata, M. G.; Jun. 20, 2006; 138 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898501; UCRL-TR-222275; No Copyright; Avail.: National Technical Information Service (NTIS)
The authors have developed a set of modeled nuclear reaction cross sections for use in radiochemical diagnostics. Systematics for the input parameters required by the Hauser-Feshbach statistical model were developed and used to calculate neutron, proton, and deuteron induced nuclear reaction cross sections for targets ranging from strontium (Z = 38) to rhodium (Z = 45).
NTIS
Charged Particles; Molybdenum; Neutrons; Niobium; Nuclear Reactions; Radiochemistry; Yttrium; Zirconium

20070024931 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Studies of Transverse Spin Effects at Jlab
Avakian, H.; Boster, P.; Burters, V.; Elouadrhin, L.; Jun. 01, 2006; 8 pp.; In English
Contract(s)/Grant(s): AC05-84ER40150
Report No.(s): DE2007-898820; JLAB-PHY-05-486; DOE/ER/40150-4161; No Copyright; Avail.: National Technical Information Service (NTIS)
The authors present ongoing and future studies of single-spin asymmetries in semi-inclusive electroproduction of pions using the CEBAF polarized electron beam. Kinematic dependences of single-spin asymmetries have been measured in a wide kinematic range at CLAS with a polarized NH(sub 3) target. Significant target-spin sin 2(phi) and sin (phi) asymmetries have been observed, indicating a non-zero Collins fragmentation function and supporting future SIDIS measurements with upgraded JLab.
NTIS
Electron Beams; Kinematics; Linear Accelerators

20070024976 Lawrence Livermore National Lab., Livermore, CA USA
Transmission Grating Measurements of Undulator K
Bionta, R. M.; Ott, L. L.; May 15, 2006; 16 pp.; In English
Report No.(s): DE2007-899383; UCRL-TR-221499; No Copyright; Avail.: National Technical Information Service (NTIS)
This study was undertaken to understand the practicalities of determine K differences in the undulator modules by measuring single-shot x-ray spectra of the spontaneous radiation with a transmissive grating spectrometer under development to measure FEL spectra. Since the quality of the FEL is dependent on a uniform K value in all the undulator modules, being able to measure the relative undulator K values is important. Preliminary results were presented in a presentation, 'Use of FEL Off-Axis Zone Plate Spectrometer to Measure Relative K by the Pinhole/Centroid Method', at the 'LCLS Beam-Based Undulator K Measurements Workshop' on November 14, 2005 (UCRL-PRES-217281). This study applies equally well to reflective gratings of the appropriate period and inclinations.
NTIS
Gratings (Spectra); Wiggler Magnets

20070024979 Department of Energy, Washington, DC, USA, Lawrence Livermore National Lab., Livermore, CA USA
Space-Charge Transport Limits of Ion Beams in Periodic Quadrupole Focusing Channels
Lund, S. M.; Chawla, S. R.; Feb. 23, 2006; 13 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2007-898857; LBNL--59927; HIFAN 1378; No Copyright; Avail.: National Technical Information Service (NTIS)

It has been empirically observed in both experiments and particle-in-cell simulations that space-charge-dominated beams suffer strong growth in statistical phase-space area (degraded quality) and particle losses in alternating gradient quadrupole transport channels when the undepressed phase advance (sigma)(sub 0) increases beyond about 85(sup o) per lattice period. Although this criterion has been used extensively in practical designs of strong focusing intense beam transport lattices, the origin of the limit has not been understood. We propose a mechanism for the transport limit resulting from classes of halo particle resonances near the core of the beam that allow near-edge particles to rapidly increase in oscillation amplitude when the space-charge intensity and the utter of the matched beam envelope are both sufficiently large. When coupled with a diffuse beam edge and/or perturbations internal to the beam core that can drive particles outside the edge, this mechanism can result in large and rapid halo-driven increases in the statistical phase-space area of the beam, lost particles, and degraded transport. A core-particle model is applied to parametrically analyze this process. Extensive self-consistent particle in cell simulations are employed to better quantify properties of the space-charge limits and to verify core-particle model predictions.
NTIS
Charge Transfer; Emittance; Ion Beams; Quadrupoles; Space Charge

20070024993 Beyer Weaver and Thomas, LLP, Oakland, CA, USA, Stanford Univ., CA, USA
Non-Linear Symmetric Sweep Spectral-Spatial RF Pulses for MR Spectroscopy
Cunningham, C. H., Inventor; Pauly, J. M., Inventor; Vigneron, D. B., Inventor; 13 Apr 04; 17 pp.; In English
Contract(s)/Grant(s): R01CA059897
Patent Info.: Filed Filed 13 Apr 04; US-Patent-Appl-SN-10-823 979
Report No.(s): PB2007-105872; No Copyright; Avail.: CASI: A03, Hardcopy

A method for designing non-linear phase 180 degree spectral-spatial radio frequency pulses that can be used for spectral editing in magnetic resonance spectroscopic imaging. A novel feature of the pulse is a symmetric sweep developed by the spectral profile from the outside edges of the spectral window towards the middle whereby coupled components are tipped simultaneously and over a short interval. Pulses have been designed for lactate editing at 1.5 T and 3 T. The spectral and spatial spin-echo profiles of the RF pulses can be measured experimentally and altered in an iterative manner. Spectral-spatial radio frequency (SSRF) pulses allow simultaneous selection in both frequency and spatial domains. These pulses are particularly important for clinical and research magnetic resonance spectroscopy (MRS) applications for suppression of large water and lipid resonances.
NTIS
Editing; Magnetic Resonance Spectroscopy; Nonlinearity; Radio Frequencies; Spectra; Spectroscopy

20070025052 NASA Johnson Space Center, Houston, TX, USA
Mechanical Properties of Cells
Bradley, Robert; Becerril, Joseph; Jeevarajan, Anthony; August 08, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Many physiologic and pathologic processes alter the biomechanical properties of the tissue they affect, and these changes may be manifest at the single cell level. The normal and abnormal mechanical properties of a given cell type can be established with the aid of an atomic force microscope (AFM), nonetheless, consistency in the area of the tip has been a mayor limitation of using the AFM for quantitative measurements of mechanical properties. This project attempts to overcome this limitation by using materials with a known elastic modulus, which resembles the one of the cell, to create force-deformation curves to calculate the area of indentation by means of Hooke s Law (sigma = E(epsilon)), which states that stress (sigma) is proportional to the strain (epsilon) where the constant of proportionality, E, is called the Young s modulus, also referred as the elastic modulus. Hook s Law can be rearranged to find the area of indentation (Area= Force/ E(epsilon)), where the indentation force is defined by the means of the added mass spring calibration method.
Author
Hookes Law; Cells (Biology); Mechanical Properties; Biodynamics; Modulus of Elasticity

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*.

20070024920 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands
MFP-REA Follow-up 2002-2005
Simons, D. G.; vanMoll, C. A. M.; March 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.31956
Report No.(s): TNO-DV-2006-A459; TD2006-0143; Copyright; Avail.: Other Sources

Acoustic propagation in shallow water depends among others on the composition of the sea bottom. It is very desirable for the navy to use passive acoustic methods instead of active, to acquire knowledge about this composition. The intention of the Matched Field Inversion - Rapid Environmental Assessment project is to use ambient noise received on a vertical array for this bottom classification. To exploit the limited information content of ambient noise, a well chosen geoacoustic model is required, together with an efficient optimisation algorithm and an educated interpretation of the inversion results. This combination of knowledge has resulted in several articles, which are summarised in this report.
Author
Acoustic Propagation; Models; Continuous Noise; Background Noise; Underwater Acoustics

20070025034 NASA Johnson Space Center, Houston, TX, USA
Fan Database and Web-tool for Choosing Quieter Spaceflight Fans
Allen, Christopher S.; Burnside, Nathan J.; [2007]; 1 pp.; In English; NoiseCON 2007, 21-24 Oct. 2007, Reno, NV, USA
Contract(s)/Grant(s): 401769.06.03.07.03.01; No Copyright; Avail.: Other Sources; Abstract Only

One critical aspect of designing spaceflight hardware is the selection of fans to provide the necessary cooling. And with efforts to minimize cost and the tendancy to be conservative with the amount of cooling provided, it is easy to choose an overpowered fan. One impact of this is that the fan uses more energy than is necessary. But, the more significant impact is that the hardware produces much more acoustic noise than if an optimal fan was chosen. Choosing the right fan for a specific hardware application is no simple task. It requires knowledge of cooling requirements and various fan performance characteristics as well as knowledge of the aerodynamic losses of the hardware in which the fan is to be installed. Knowledge of the acoustic emissions of each fan as a function of operating condition is also required in order to choose a quieter fan for a given design point. The purpose of this paper is to describe a database and design-tool that have been developed to aid spaceflight hardware developers in choosing a fan for their application that is based on aerodynamic performance and reduced acoustic emissions as well. This web-based-tool provides a limited amount of fan-data, provides a method for selecting a fan based on its projected operating point, and also provides a method for comparing and contrasting aerodynamic performance and acoustic data from different fans. Drill-down techniques are used to display details of the spectral noise characteristics of the fan at specific operation conditions. The fan aerodynamic and acoustic data were acquired at Ames Research Center in the Experimental Aero-Physics Branch's Anechoic Chamber. Acoustic data were acquired according to ANSI Standard S12.11-1987, 'Method for the Measurement of Noise Emitted by Small Air-Moving Devices.' One significant improvement made to this technique included automation that allows for a significant increase in flow-rate resolution. The web-tool was developed at Johnson Space Center and is based on the web-development application, SEQUEL, which includes graphics and drill-down capabilities. This paper will describe the type and amount of data taken for the fans and will give examples of this data. This paper will also describe the data-tool and gives examples of how it can be used to choose quieter fans for use in spaceflight hardware.
Author
Data Bases; Fans; Hardware; World Wide Web; Noise Reduction; Space Flight

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20070024982 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Massachusetts Inst. of Tech., Cambridge, MA, USA, College of William and Mary, Williamsburg, VA, USA
Nuclear Physics from Lattice QCD: The Spectrum, Structure and Interactions of Hadrons
Morningstar, C.; Negele, J. W.; Orginos, K.; Richards, D.; Savage, M. J.; January 2006; 14 pp.; In English
Report No.(s): DE2007-899162; No Copyright; Avail.: National Technical Information Service (NTIS)

The importance of lattice QCD to our understanding of the structure, spectroscopy, and interaction of hadrons is decribed. Recent accomplishments in each of these areas is outlined, and the opportunities emerging with increasing computational power are identified. Milestones at the 10 Tflops-years, 100 Tflops-years and Petaflops-years scales are presented.
NTIS
Hadrons; Nuclear Physics; Quantum Chromodynamics

74
OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20070023776 Florida Univ., Gainesville, FL USA
Comparative Performance Analysis of Parallel Beamformers
Kim, Keonwook; George, Alan D; Sinha, Priyabrata; Jan 1999; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0278
Report No.(s): AD-A465877; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465877

Advancements in beamforming algorithms are exceeding the computation and communication capabilities of traditional sonar array systems. Implementing parallel beamforming algorithms in situ on distributed array systems holds the potential to provide increased performance and fault tolerance at a lower cost. This paper compares three parallel algorithms for distributed arrays in terms of execution throughput, result latency, scaled speedup, and parallel efficiency.
DTIC
Beamforming; Reliability Analysis; Sonar

20070023906 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Speckle Noise in Highly Corrected Coronagraphs
Bloemhof, Eric E.; August 2, 2004; 9 pp.; In English; SPIE 49th International Symposium on Optical Science and Technology Annual Meeting, 2-6 Aug. 2004, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40131

Speckles in a highly corrected adaptive optic imaging system have been studied through numerical simulations and through analytic and algebraic investigations of the Fourier-optical expressions connecting pupil plane and focal plane, which simplify at high Strehl ratio. Significant insights into the behavior of speckles, and the speckle noise caused when they vary over time, have thus been gained. Such speckle noise is expected to set key limits on the sensitivity of searches for companions around other stars, including extrasolar planets. In most cases, it is advantageous to use a coronagraph of some kind to suppress the bright primary star and so enhance the dynamic range of companion searches. In the current paper, I investigate speckle behavior and its impact on speckle noise in some common coronagraphic architectures, including the classical Lyot coronagraph and the new four quadrant phase mask (FQPM) concept.
Author
Coronagraphs; Adaptive Optics; Atmospheric Turbulence; Speckle Patterns; Mathematical Models

20070024671 Lawrence Livermore National Lab., Livermore, CA USA

Use of a Near Back-Scattering Imaging System on the National Ignition Facility

Mackinnon, A. J.; Niemann, C.; Piston, K.; Holtmeier, G.; McCarbille, T. J.; May 08, 2006; 15 pp.; In English

Report No.(s): DE2007-899385; UCRL-CONF-221190; No Copyright; Avail.: National Technical Information Service (NTIS)

A near back-scattering imaging diagnostic system has been implemented, qualified and fielded on the first quad of beams on the National Ignition Facility. This diagnostic images diffusing scatter plates, placed around the final focus lenses on the NIF target chamber, to quantitatively measure the fraction of light back-scattered outside of the incident cone of the focusing optics. The imaging system consists of a wide-angle lens coupled to a gated CCD camera, providing 3mm resolution over a 2m field of view. To account for changes of the system throughput due to exposure to target debris the system was routinely calibrated in situ at 532nm and 355nm using a dedicated pulsed laser source. The diagnostic and calibration methods will be described together with recent results from the NIF early light shots.

NTIS

Backscattering; Ignition; Imaging Techniques; Test Facilities

20070024673 Lawrence Livermore National Lab., Livermore, CA USA

Understanding How Femtosecond Laser Waveguide Fabrication in Glasses Work

Reichman, W. J.; May 22, 2006; 131 pp.; In English

Report No.(s): DE2007-899386; UCRL-TH-221547; No Copyright; Avail.: National Technical Information Service (NTIS)

In order to understand the physical processes associated with fs-laser waveguide writing in glass, the effects of the laser repetition rate, the material composition and feature size were studied. The resulting material changes were observed by collecting Raman and fluorescence spectra with a confocal microscope. The guiding behavior of the waveguides was evaluated by measuring near field laser coupling profiles in combination with white light microscopy.

NTIS

Fabrication; Glass; Lasers; Waveguides

20070024682 Lawrence Livermore National Lab., Livermore, CA USA

Deformable Nanolaminate Optics

Olivier, S. S.; Papavasiliou, A. P.; Barbee, T. W.; Miles, R. R.; Walton, C. C.; May 15, 2006; 13 pp.; In English

Report No.(s): DE2007-899401; UCRL-PROC-221371; No Copyright; Avail.: Department of Energy Information Bridge

We are developing a new class of deformable optic based on electrostatic actuation of nanolaminate foils. These foils are engineered at the atomic level to provide optimal opto-mechanical properties, including surface quality, strength and stiffness, for a wide range of deformable optics. We are combining these foils, developed at Lawrence Livermore National Laboratory (LLNL), with commercial metal processing techniques to produce prototype deformable optics with aperture sizes up to 10 cm and actuator spacing from 1 mm to 1 cm and with a range of surface deformation designed to be as much as 10 microns. The existing capability for producing nanolaminate foils at LLNL, coupled with the commercial metal processing techniques being used, enable the potential production of these deformable optics with aperture sizes of over 1 m, and much larger deformable optics could potentially be produced by tiling multiple deformable segments. In addition, based on the fabrication processes being used, deformable nanolaminate optics could potentially be produced with areal densities of less than 1 kg per square m for applications in which lightweight deformable optics are desirable, and deformable nanolaminate optics could potentially be fabricated with intrinsically curved surfaces, including aspheric shapes. We will describe the basic principles of these devices, and we will present details of the design, fabrication and characterization of the prototype deformable nanolaminate optics that have been developed to date.

NTIS

Deformation; Optics; Nanotechnology; Laminates; Fabrication; Foils

20070024692 Lawrence Livermore National Lab., Livermore, CA USA

FY2005 Progress Summary and FY2006 Program Plan Statement of Work and Deliverables for Development of High Average Power Diode-Pumped Solid State Lasers, and Complementary Technologies, for Applications in Energy and Defense

Ebbers, C.; Mar. 29, 2006; 67 pp.; In English

Report No.(s): DE2007-899419; UCRL-TR-220224; No Copyright; Avail.: National Technical Information Service (NTIS)

The primary focus this year was to operate the system with two amplifiers populated with and pumped by eight high

power diode arrays. The system was operated for extended run periods which enabled average power testing of components, diagnostics, and controls. These tests were highly successful, with a demonstrated energy level of over 55 joules for 4 cumulative hours at a repetition rate of 10 Hz (average power 0.55 kW). In addition, high average power second harmonic generation was demonstrated, achieving 227 W of 523.5 nm light (22.7 J, 10 Hz, 15 ns, 30 minutes) Plans to achieve higher energy levels and average powers are in progress. The dual amplifier system utilizes a 4-pass optical arrangement. The Yb:S-FAP slabs were mounted in aerodynamic aluminum vane structures to allow turbulent helium gas flow across the faces. Diagnostic packages that monitored beam performance were deployed during operation. The laser experiments involved injecting a seed beam from the front end into the system and making four passes through both amplifiers. Beam performance diagnostics monitored the beam on each pass to assess system parameters such as gain and nearfield intensity profiles. This year, an active mirror and wavefront sensor were procured and demonstrated in an off-line facility.
NTIS
Diodes; High Power Lasers; Laser Materials; Project Planning; Solid State Lasers

20070024718 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
High Contrast Imaging Testbed for the Terrestrial Planet Finder Coronagraph
Lowmman, Andrew E.; Trauger, John T.; Gordon, Brian; Green, Joseph J.; Moody, Dwight; Niessner, Albert F.; Shi, Fang; June 21, 2004; 9 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 21 Jun. 2004, Glasgow, Scotland, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40007

The Terrestrial Planet Finder (TPF) mission is planning to launch a visible coronagraphic space telescope in 2014. To achieve TPF science goals, the coronagraph must have extreme levels of wavefront correction (less than 1 Angstrom rms over controllable spatial frequencies) and stability to get the necessary suppression of diffracted starlight (approximately l0(exp -10)) contrast at an angular separation approximately 4 (lamda)/D). TPF Coronagraph's primary platform for experimentation is the High Contrast Imaging Testbed, which will provide laboratory validation of key technologies as well as demonstration of a flight-traceable approach to implementation. Precision wavefront control in the testbed is provided by a high actuator density deformable mirror. Diffracted light control is achieved through use of occulting or apodizing masks and stops. Contrast measurements will establish the technical feasibility of TPF requirements, while model and error budget validation will demonstrate implementation viability. This paper describes the current testbed design, development approach, and recent experimental results.
Author
Coronagraphs; Spaceborne Telescopes; Adaptive Optics; Deformable Mirrors; Test Facilities

20070024739 Whitham, Curtis and Christofferson, PC, Reston, VA, USA
Polar Ordering of Reactive Chromophores in Layer-by-Layer Nonlinear Optical Materials
Van Cott, K., Inventor; Heflin, J. R., Inventor; Gibson, H., Inventor; Davis, R. M., Inventor; 28 Feb 05; 14 pp.; In English
Contract(s)/Grant(s): NSF-ECS-9907747
Patent Info.: Filed Filed 28 Feb 05; US-Patent-Appl-SN-11-067-218
Report No.(s): PB2007-104224; No Copyright; Avail.: CASI: A03, Hardcopy

Thin films exhibiting second-order nonlinear optical (NLO) properties, as well as materials and methods for producing such films, are provided. The films are formed by depositing, on a substrate, alternate layers of a polyelectrolyte and a low molecular weight chromophore. The chromophore contains an electrophilic group that reacts with a previously deposited polyelectrolyte, and ionizable groups which present absorption sites for the next polyelectrolyte layer. The films find application in, for example, electro-optic modulators and frequency doubling devices.
NTIS
Nonlinearity; Optical Materials; Patent Applications; Reactivity; Thin Films

20070024746 Oliff and Berridge, PLC, Alexandria, VA, USA, Center for Planning and Research, Inc., Palo Alto, CA, USA
Ultraviolet Group III-Nitride-Based Quantum Well Laser Diodes
Knelssi, M. A., Inventor; Treat, D. W., Inventor; 17 Dec 03; 18 pp.; In English
Contract(s)/Grant(s): N6600102C8017
Patent Info.: Filed Filed 17 Dec 03; US-Patent-Appl-SN-10-736 643
Report No.(s): PB2007-105877; No Copyright; Avail.: CASI: A03, Hardcopy

A pair of undoped spacer layers are provided adjacent to, or near to, a single quantum well aluminum gallium nitride

active region. In various exemplary embodiments, the undoped spacer layers are provided between the single quantum well aluminum gallium nitride active region and carrier confinement layers. The undoped spacer layers reduce the threshold current for the laser device and improve the output characteristics.
NTIS
Nitrides; Quantum Well Lasers; Semiconductor Lasers; Spacers; Spectra; Ultraviolet Radiation

20070024862 Lawrence Livermore National Lab., Livermore, CA USA
Multilayer Defects Nucleated by Substrate Pits: a Comparison of Actinic Inspection and Non-actinic Inspection Techniques
Barty, A.; Goldberg, K.; Kearney, P.; Rekawa, S.; LaFontaine, B.; Nov. 03, 2006; 10 pp.; In English
Report No.(s): DE2007-897930; UCRL-PROC-225851; No Copyright; Avail.: National Technical Information Service (NTIS)

The production of defect-free mask blanks remains a key challenge for EUV lithography. Mask-blank inspection tools must be able to accurately detect all critical defects while simultaneously having the minimum possible false-positive detection rate. We have recently observed and here report the identification of bump-type buried substrate defects, that were below the detection limit of a non-actinic (i.e. non-EUV) in inspection tool. Presently, the occurrence spection of pit-type defects, their printability, and their detectability with actinic techniques and non-actinic commercial tools, has become a significant concern. We believe that the most successful strategy for the development of effective non-actinic mask inspection tools will involve the careful cross-correlation with actinic inspection and lithographic printing. In this way, the true efficacy of prototype inspection tools now under development can be studied quantitatively against relevant benchmarks. To this end we have developed a dual-mode actinic mask inspection system capable of scanning mask blanks for defects (with simultaneous EUV bright-field and dark-field detection) and imaging those same defects with a zoneplate microscope that matches or exceeds the resolution of EUV steppers.
NTIS
Defects; Inspection; Light Sources; Masks

20070024896 Office of the Secretary of the Army, Washington, DC, USA, Army Tank-Automotive Research and Development Command, Warren, MI, USA
Simultaneous 4-Stokes Parameter Determination Using a Single Digital Image
Gerhart, G. R., Inventor; Matchko, R. M., Inventor; 13 Apr 04; 10 pp.; In English
Patent Info.: Filed Filed 13 Apr 04; US-Patent-Appl-SN-10-822 355
Report No.(s): PB2007-105867; No Copyright; Avail.: CASI: A02, Hardcopy

A method and apparatus for determining and displaying polarization profiles of points in a scene from a single imaging detector array, which utilizes a filter system comprised of a retarder, four linear polarizers, four lenses, a color filter, camera lens and CCD video camera. Light from points in a scene are transmitted through the system and exits with attenuated intensities unique for each wavelength of the light. A narrowband color filter selects the wavelength of interest. The four lenses in the system produce four images of the scene, which are recorded as a single CCD-image. The attenuated intensities in each of the four scene-images are used to calculate the Stokes parameters for selected points in the scene for the selected wavelength. The inherent problem of the retarder introducing a different phase differential for each individual wavelength transmitted through the optical element is solved by expressing the Stokes parameters explicitly as a function of wavelength. A computer program separates the four scene-images in the CCD-image, crops, registers them and calculates the Stokes parameters for each point in the cropped scene. A unique pseudo-color scheme that utilizes the Poincar sphere is used for encoding and displaying polarization parameters. This scheme associates the RGB values of an image with the normalized values of the Stokes parameters. The primary purpose of the method, apparatus and pseudo-color scheme is to obtain the four Stokes parameters simultaneously for each point in a scene and to be able to create video images of changing polarization parameters in real time.
NTIS
Imaging Techniques; Digital Cameras; Detectors; Video Communication

20070024913 Lawrence Livermore National Lab., Livermore, CA USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Actinic Inspection of EUV Programmed Multilayer Defects and Cross-Comparison Measurements

Goldberg, K.; Barty, A.; Liu, Y.; Kearney, P.; Tezuka, Y.; Jul. 06, 2006; 16 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): DE2007-898495; UCRL-PROC-222614; No Copyright; Avail.: Department of Energy Information Bridge

The production of defect-free mask blanks remains a key challenge for extreme ultraviolet (EUV) lithography. Integral to this effort is the development and characterization of mask inspection tools that are sensitive enough to detect critical defects with high confidence. Using a single programmed-defect mask with a range of buried bump-type defects, we report a comparison of measurements made in four different mask-inspection tools: one commercial tool using 488-nm wavelength illumination, one prototype tool that uses 266-nm illumination, and two non-commercial EUV 'actinic' inspection tools. The EUV tools include a darkfield imaging microscope and a scanning microscope. Our measurements show improving sensitivity with the shorter wavelength non-EUV tool, down to 33-nm spherical-equivalent-volume diameter, for defects of this type. Measurements conditions were unique to each tool, with the EUV tools operating at a much slower inspection rate. Several defects observed with EUV inspection were below the detection threshold of the non-EUV tools.

NTIS

Defects; Extreme Ultraviolet Radiation; Inspection; Masks

20070024973 Sandia National Labs., Albuquerque, NM USA

LDRD Final Report on Using Chaos for Ultrasensitive Coherent Signal Detection

Wieczorek, S.; Chow, W.; Torrington, G.; Nov. 2006; 48 pp.; In English

Report No.(s): DE2007-899374; SAND2006-7265; No Copyright; Avail.: National Technical Information Service (NTIS)

A quantum optical approach is proposed and analyzed as a solution to the problem of detecting weak coherent radiation in the presence of a strong incoherent background. The approach is based on the extreme sensitivity of laser dynamical nonlinearities to the coherence of external perturbation. This sensitivity leads to dynamical phase transitions that may be employed for detecting the presence of external coherent radiation. Of particular interest are the transitions between stable and chaotic states of laser operation. Using a baseline scheme consisting of a detector laser operating with a Fabry-Perot cavity, we demonstrated significant qualitative and quantitative differences in the response of the detector laser to the intensity and coherence of the external signal. Bifurcation analysis revealed that considerable modification to the extension of chaotic regions is possible by tailoring active medium and optical resonator configurations. Our calculations showed that with semiconductor lasers, destabilization can occur with a coherent external signal intensity that is over six orders of magnitude smaller than the detector lasers intracavity intensity. Discrimination between coherent and incoherent external signal also looks promising because of the over four orders of magnitude difference in intensity required for inducing chaos-like behavior.

NTIS

Chaos; Optical Equipment; Signal Detection

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20070024680 Lawrence Livermore National Lab., Livermore, CA USA

Evidence for Anomalous Effects on the Current Evolution in Tokamak Operating Scenarios

Casper, T. A.; Jayakumar, R. J.; Allen, S. L.; Holcomb, C. T.; Makowski, M. A.; Oct. 03, 2006; 10 pp.; In English

Report No.(s): DE2007-897924; UCRL-PROC-225028; No Copyright; Avail.: National Technical Information Service (NTIS)

Alternatives to the usual picture of advanced tokamak (AT) discharges are those that form when anomalous effects alter the plasma current and pressure profiles and those that achieve stationary characteristics through mechanisms so that a measure of desired AT features is maintained without external current-profile control. Regimes exhibiting these characteristics are those where the safety factor (q) evolves to a stationary profile with the on-axis and minimum q (approx) 1 and those with a deeply hollow current channel and high values of q. Operating scenarios with high fusion performance at low current and where the inductively driven current density achieves a stationary configuration with either small or non-existing sawteeth may enhance the neutron fluence per pulse on ITER and future burning plasmas. Hollow current profile discharges exhibit high confinement

and a strong 'box-like' internal transport barrier (ITB). We present results providing evidence for current profile formation and evolution exhibiting features consistent with anomalous effects or with self-organizing mechanisms. Determination of the underlying physical processes leading to these anomalous effects is important for scaling of current experiments for application in future burning plasmas.
NTIS
Current Density; Plasma Control; Tokamak Devices

20070024691 Lawrence Livermore National Lab., Livermore, CA USA
Conversion of NIMROD Simulation Results for Graphical Analysis Using Vislt
Romero-Talamas, C. A.; May 05, 2006; 18 pp.; In English
Report No.(s): DE2007-899417; UCRL-TR-221145; No Copyright; Avail.: National Technical Information Service (NTIS)
Software routines developed to prepare NIMROD (C. R. Sovinec et al., J. Comp. Phys. 195, 355 (2004)) results for three-dimensional visualization from simulations of the Sustained Spheromak Physics Experiment (SSPX) (E. B. Hooper et al., Nucl. Fusion 39, 863 (1999)) are presented here. The visualization is done by first converting the NIMROD output to a format known as legacy VTK and then loading it to VisIt, a graphical analysis tool that includes three-dimensional rendering and various mathematical operations for large data sets. Sample images obtained from the processing of NIMROD data with VisIt are included.
NTIS
Simulation; Tokamak Devices

20070024698 Lawrence Livermore National Lab., Livermore, CA USA
Heat Loss by Helicity Injection II
Fowler, T. K.; Apr. 26, 2006; 16 pp.; In English
Report No.(s): DE2007-897926; UCRL-TR-220863; No Copyright; Avail.: Department of Energy Information Bridge
Arguments are reviewed showing that helicity transport always flattens the temperature profile, yielding unit current amplification in SSPX and flat temperature profiles in RFP's whenever the dynamo is active. The argument is based on transport theory yielding a hyper-resistivity (Lambda) (approx) (c(sup 2)/(omega)(sub pc)(sup 2))(chi)(sub c) with electron thermal diffusivity (chi)(sub c), valid for any process producing a random-walk in electron constants of motion in the unperturbed field. The theory could be tested by deriving (Lambda) from helicity transport in SSPX, by analogy with recent analysis yielding (chi)(sub c) from heat transport. If the predicted ratio (Lambda)/(chi)(sub c) is confirmed, efforts to increase current amplification in SSPX must be based on scenario scenarios consistent with slow helicity transport compared to heat s transport (pulsed reactor, multipulse, neutral beam injection).
NTIS
Cooling; Injection; Spheromaks

20070024867 Lawrence Livermore National Lab., Livermore, CA USA
Gyrokinetic Simulations of ETG and ITG Turbulence
Dimits, A. M.; Nevins, W. M.; Shumaker, D. E.; Hammett, G. W.; Dannert, T.; Oct. 05, 2006; 10 pp.; In English
Report No.(s): DE2007-897932; UCRL-PROC-225033; No Copyright; Avail.: National Technical Information Service (NTIS)
Published gyrokinetic continuum-code simulations indicated levels of the electron thermal conductivity (chi)(sub e) due to electron-temperature-gradient (ETG) turbulence large enough to be significant in some tokamaks, while subsequent global particle-in-cell (PIC) simulations gave significantly lower values. We have carried out an investigation of this discrepancy. We have reproduced the key features of the aforementioned PIC simulations using the flux-tube gyrokinetic PIC code, PG3EQ, thereby eliminating global effects and as the cause of the discrepancy. We show that the late-time low-transport state in both of these sets of PIC simulations is a result of discrete particle noise, which is a numerical artifact. Thus, the low value of (chi)(sub e) along with conclusions about anomalous transport drawn from these particular PIC simulations are unjustified. In our attempts to benchmark PIC and continuum codes for ETG turbulence at the plasma parameters used above, both produce very large intermittent transport. We have therefore undertaken benchmarks at an alternate reference point, magnetic shear s=0.1 instead of s=0.796, and have found that PIC and continuum codes reproduce the same transport levels. Scans in the magnetic shear show an abrupt transition to a high-(chi)(sub e) state as the shear is increased above s=0.4. When nonadiabatic ions are used, this abrupt transition is absent, and (chi)(sub e) increases gradually reaching values consistent with transport analyses of DIII-D, JET, and JT60-U discharges. New results on the balances of zonal-flow driving and damping terms in

late-time quasi-steady ITG turbulence and on real-geometry gyrokinetic simulations of shaped DIII-D discharges are also reported.
NTIS
Electrons; Simulation; Turbulence

20070024910 Lawrence Livermore National Lab., Livermore, CA USA
Improving the Capabilities of a Continuum Laser Plasma Interaction Code
Hittinger, J. A. F.; Dorr, M. R.; Jun. 16, 2006; 12 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898485; UCRL-CONF-222175; No Copyright; Avail.: National Technical Information Service (NTIS)

The numerical simulation of plasmas is a critical tool for inertial confinement fusion (ICF). We have been working to improve the predictive capability of a continuum laser plasma interaction code pF3d, which couples a continuum hydrodynamic model of an unmagnetized plasma to paraxial wave equations modeling the laser light. Advanced numerical techniques such as local mesh refinement, multigrid, and multifluid Godunov methods have been adapted and applied to nonlinear heat conduction and to multifluid plasma models. We describe these algorithms and briefly demonstrate their capabilities.
NTIS
Algorithms; Confinement; Continuums; Laser Plasma Interactions; Lasers; Plasmas (Physics)

20070024941 Geological Survey, Reston, VA USA
Relation of Chlorofluorocarbon Ground-Water Age Dates to Water Quality in Aquifers of West Virginia
McCoy, K. J.; Kozar, M. D.; January 2006; 45 pp.; In English
Report No.(s): PB2007-108565; USGS-SIR-2006-5221; No Copyright; Avail.: CASI: A03, Hardcopy

The average apparent age of ground water in fractured-bedrock aquifers in West Virginia was determined using chlorofluorocarbon (CFC) dating methods. Since the introduction of CFC gases as refrigerants in the late 1930s, atmospheric concentrations have increased until production ceased in the mid-1990s. CFC dating methods are based on production records that date to the early 1940s, and the preservation of atmospheric CFC concentrations in ground water at the time of recharge. As part of the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) and Ambient Ground-Water Monitoring Network (AGN) programs in West Virginia from 1997 to 2005, 80 samples from the Appalachian Plateaus Physiographic Province, 27 samples from the Valley and Ridge Physiographic Province, and 5 samples from the Ohio River alluvial aquifers were collected to estimate ground-water ages in aquifers of West Virginia.
NTIS
Aquifers; Chlorocarbons; Chronology; Fluorocarbons; Ground Water; Time Measurement; Water Quality; West Virginia

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*.

20070024725 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Low Q(sup2) Measurements of the Neutron and (sup3)He spin Structure
Sulkosky, V. A.; Oct. 2006; 4 pp.; In English
Report No.(s): DE2007-899226; JLAB-PHY-06-608; No Copyright; Avail.: National Technical Information Service (NTIS)

Thomas Jefferson National Accelerator Facility experiment E97-110 was performed to provide a precise measurement of the extended Gerasimov-Drell-Hearn integral and of moments of the neutron and of the (sup 3)He spin structure functions. The momentum transfer range 0.02<0.3<Q(sup 2)<0.3 (GeV/c)(sup 2) will allow us to test predictions of Chiral Perturbation Theory, and check the GDH sum rule by extrapolating the integral to the real photon point. The data have been taken in Hall A using a highly polarized electron beam and a polarized (sup 3)He target. The status of the data analysis is discussed, and preliminary results are shown.
NTIS
Helium; Neutrons; Particle Accelerators

20070024828 Stanford Linear Accelerator Center, CA, USA

Laser-Wire System at the ATF Extraction Line

Boosert, S. T.; Blair, C.; Boorman, G.; Bosco, A.; Deacon, L.; Feb. 12, 2007; 19 pp.; In English

Contract(s)/Grant(s): AC02-76SF00515

Report No.(s): DE2007-898568; SLAC-PUB-12328; No Copyright; Avail.: National Technical Information Service (NTIS)

Particle accelerators are among the most complex and versatile instruments of scientific exploration. They have enabled remarkable scientific discoveries and important technological advances that span all programs within the DOE Office of Science (DOE/SC). The importance of accelerators to the DOE/SC mission is evident from an examination of the DOE document, 'Facilities for the Future of Science: A Twenty-Year Outlook'. Of the 28 facilities listed, 13 involve accelerators. Thanks to SciDAC, a powerful suite of parallel simulation tools has been developed that represent a paradigm shift in computational accelerator science. Simulations that used to take weeks or more now take hours, and simulations that were once thought impossible are now performed routinely. These codes have been applied to many important projects of DOE/SC including existing facilities (the Tevatron complex, the Relativistic Heavy Ion Collider), facilities under construction (the Large Hadron Collider, the Spallation Neutron Source, the Linac Coherent Light Source), and to future facilities (the International Linear Collider, the Rare Isotope Accelerator). The new codes have also been used to explore innovative approaches to charged particle acceleration. These approaches, based on the extremely intense fields that can be present in lasers and plasmas, may one day provide a path to the outermost reaches of the energy frontier. Furthermore, they could lead to compact, high-gradient accelerators that would have huge consequences for US science and technology, industry, and medicine. In this talk I will describe the new accelerator modeling capabilities developed under SciDAC, the essential role of multi-disciplinary collaboration with applied mathematicians, computer scientists, and other IT experts in developing these capabilities, and provide examples of how the codes have been used to support DOE/SC accelerator projects.

NTIS

Extraction; Lasers; Wire

20070024939 Fermi National Accelerator Lab., Batavia, IL, USA

Tevatron-for-LHC Report of the QCD Working Group

Albrow, M.; Begel, M.; Bourilkov, D.; Campanelli, M.; Chlebana, F.; January 2006; 156 pp.; In English

Report No.(s): DE2007-899355; FERMILAB-CONF-06-359; No Copyright; Avail.: National Technical Information Service (NTIS)

The experiments at Run 2 of the Tevatron have each accumulated over 1 fb-1 of high-transverse momentum data. Such a dataset allows for the first precision (i.e. comparisons between theory and experiment at the few percent level) tests of QCD at a hadron collider. While the Large Hadron Collider has been designed as a discovery machine, basic QCD analyses will still need to be performed to understand the working environment. The Tevatron-for-LHC workshop was conceived as a communication link to pass on the expertise of the Tevatron and to test new analysis ideas coming from the LHC community. The TeV4LHC QCD Working Group focussed on important aspects of QCD at hadron colliders: jet definitions, extraction and use of Parton Distribution Functions, the underlying event, Monte Carlo tunes, and diffractive physics. This report summarizes some of the results achieved during this workshop.

NTIS

Hadrons; Particle Accelerators

20070024940 Sandia National Labs., Albuquerque, NM USA

MOCVD Synthesis of Group III-Nitride Heterostructure Nanowires for Solid-State Lighting

Wang, G. T.; Creighton, J. R.; Talin, A. A.; Nov. 2006; 20 pp.; In English

Report No.(s): DE2007-899363; SAND2006-6939; No Copyright; Avail.: National Technical Information Service (NTIS)

Solid-state lighting (SSL) technologies, based on semiconductor light emitting devices, have the potential to reduce worldwide electricity consumption by more than 10%, which could significantly reduce U.S. dependence on imported energy and improve energy security. The III-nitride (AlGaInN) materials system forms the foundation for white SSL and could cover a wide spectral range from the deep UV to the infrared. For this LDRD program, we have investigated the synthesis of single-crystalline III-nitride nanowires and heterostructure nanowires, which may possess unique optoelectronic properties. These novel structures could ultimately lead to the development of novel and highly efficient SSL nanodevice applications. GaN and III-nitride core-shell heterostructure nanowires were successfully synthesized by metal organic chemical vapor

deposition (MOCVD) on two-inch wafer substrates. The effect of process conditions on nanowire growth was investigated, and characterization of the structural, optical, and electrical properties of the nanowires was also performed.
NTIS
Illuminating; Metalorganic Chemical Vapor Deposition; Nanowires; Nitrides; Solid State

20070024985 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, International Business Machines Corp., San Jose, CA USA, Duke Univ., Durham, NC, USA
Progress on PEEM3 - An Aberration Corrected X-Ray Photoemission Electron Microscope at the ALS
MacDowell, A. A.; Feng, J.; DeMello, A.; Doran, A.; Duarte, R.; January 2006; 4 pp.; In English
Report No.(s): DE2007-899190; No Copyright; Avail.: Department of Energy Information Bridge

A new ultrahigh-resolution photoemission electron microscope called PEEM3 is being developed and built at the Advanced Light Source (ALS). An electron mirror combined with a much-simplified magnetic dipole separator is to be used to provide simultaneous correction of spherical and chromatic aberrations. It is installed on an elliptically polarized undulator (EPU) beamline, and will be operated with very high spatial resolution and high flux to study the composition, structure, electric and magnetic properties of complex materials. The instrument has been designed and is described. The instrumental hardware is being deployed in 2 phases. The first phase is the deployment of a standard PEEM type microscope consisting of the standard linear array of electrostatic electron lenses. The second phase will be the installation of the aberration corrected upgrade to improve resolution and throughput. This paper describes progress as the instrument enters the commissioning part of the first phase.
NTIS
Aberration; Electron Microscopes; Light Sources; Microscopes; Particle Accelerators; Photoelectric Emission; X Ray Analysis

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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*.

20070024664 Fermi National Accelerator Lab., Batavia, IL, USA
Accelerator Physics Code Web Repository
Zimmermann, F.; Basset, R.; Bellodi, G.; Benedetto, E.; Dorda, U.; January 2006; 3 pp.; In English
Report No.(s): DE2007-897177; FERMILAB-CONF-06-399; No Copyright; Avail.: National Technical Information Service (NTIS)

In the framework of the CARE HHH European Network, we have developed a web-based dynamic accelerator physics code repository. We describe the design, structure and contents of this repository, illustrate its usage, and discuss our future plans, with emphasis on code benchmarking.
NTIS
Particle Accelerators; World Wide Web; Applications Programs (Computers)

20070024665 Fermi National Accelerator Lab., Batavia, IL, USA, Manchester Univ., UK
B(sub c) and Excited B States--A Tevatron Review
Mommsen, R. K.; Dec. 2006; 5 pp.; In English
Report No.(s): DE2007-897231; FERMILAB-CONF-06-440E; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper recent results from the CDF and D0 experiments on heavy flavor spectroscopy are reported. Both experiments are using up to 1.1 fb(sup -1) of data delivered by the Tevatron proton-antiproton collider at the Fermi National Accelerator Laboratory, Batavia, IL, USA. The CDF and D0 detectors are described in references (1,2).
NTIS
Excitation; Particle Accelerators

20070024667 Fermi National Accelerator Lab., Batavia, IL, USA
Suppression of Transverse Instability by a Digital Damper
Burov, A.; Lebedev, V.; January 2006; 4 pp.; In English
Report No.(s): DE2007-897245; FERMILAB-CONF-06-183-AD; No Copyright; Avail.: National Technical Information Service (NTIS)

With cooling, beam phase space density increases, which makes the beam motion intrinsically unstable. To suppress instabilities, dampers are required. With a progress of digital technology, digital dampers are getting to be more and more preferable. Conversion of an analog signal into digital one is described by a linear operator with explicit time dependence. Thus, the analog-digital converter (ADC) does not preserve a signal frequency. Instead, a monochromatic input signal is transformed into a mixture of all possible frequencies, combining the input one with multiples of the sampling frequency. Stability analysis has to include a cross-talk between all these combined frequencies. In this paper, we are analyzing a problem of stability for beam transverse microwave oscillations in a presence of digital damper; the impedance and the space charge are taken into account. The developed formalism is applied for antiproton beam in the Recycler Ring (RR) at Fermilab.
NTIS
Antiprotons; Particle Accelerators; Damping; Stability; Transverse Oscillation

20070024669 Fermi National Accelerator Lab., Batavia, IL, USA
Identification of Electrons in the Forward Region of the CDF Experiment for the Search for Electroweak Top Quark Production
Kemp, Y.; Feb. 01, 2006; 133 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897892; FERMILAB-THESIS-2006-39; No Copyright; Avail.: National Technical Information Service (NTIS)

Until the start of the Large Hadron Collider, the Tevatron Accelerator is the facility that can look deepest into the heart of matter. In Run II of the Tevatron, protons and antiprotons collide at a center of mass energy of 1.96 TeV. Two experiment have been constructed to track known and new phenomena: CDF and DO. At the end of 2005, more than 1 fb-1 of data has been recorded by each experiment. The Institut fur Experimentelle Kernphysik in Karlsruhe is deeply involved in the search for electroweak top quark production at the CDF experiment. Indeed, the heaviest particle found up to now is the top quark. It was discovered in Run I of the Tevatron in 1995, in production mechanisms involving the strong interaction. The electroweak production mode is predicted to have about 40% the cross section of the strong interaction production mode, but the experimental signature makes it more difficult to separate the signal from the larger background. Looking for electroweak top quark production is, however, a very interesting and important field; it is a very good field for testing the Standard Model in many ways. It is possible to directly measure the CKM matrix element Vtb, which could indicate a possible fourth generation of quarks if it deviates significantly from 1. The b quark distribution function of the proton can be measured. Electroweak top quark production is an important background for the search for a light Standard Model Higgs boson at the Tevatron. It is therefore mandatory to understand and measure this production mode well.
NTIS
Electrons; Electroweak Interactions (Field Theory); Quarks; Higgs Bosons; Standard Model (Particle Physics)

20070024670 Fermi National Accelerator Lab., Batavia, IL, USA
Branching Fraction and Direct CP Asymmetries of Charmless Decay Modes at the Tevatron
Morello, M.; Dec. 01, 2006; 16 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-897894; FERMILAB-CONF-06-471-E; No Copyright; Avail.: National Technical Information Service (NTIS)

The authors present new CDF results on the branching fractions and time-integrated direct CP asymmetries for B(sup 0) and B(sub s)(sup 0) decay modes into pairs of charmless charged hadrons (pion or kaon). The data set for this update amounts to 1 fb(sup -1) of (bar p)p collisions at (radical)s = 1.96 TeV. They report the first observation of the B(sub s)(sup 0) (yields) K(sup -)(pi)(sup +) mode and a measurement of its branching fraction and direct CP asymmetry. They also observe for the first time two charmless decays of b-baryon: (Lambda)(sub b)(sup 0) (yields) p(pi)(sup -) and (Lambda)(sub b)(sup 0) (yields) pK(sup -).
NTIS
Asymmetry; Charm (Particle Physics); Particle Interactions

20070024777 Stanford Linear Accelerator Center, CA, USA, European Organization for Nuclear Research, Geneva, Switzerland

Recent Developments and Validations in Geant4 Hadronic Physics

Wright, D. H.; Koi, T.; Folger, G.; Ivantchenko, V.; Kossov, M.; January 2007; 8 pp.; In English

Report No.(s): DE2007-899569; SLAC-PUB-12348; No Copyright; Avail.: National Technical Information Service (NTIS)

The Geant4 hadronic models cover the entire range of energies required by calorimeters in new and planned experiments. The extension and improvement of the elastic, cascade, parameterized and quark-gluon string models will be discussed. Such improvements include the extension to more particle types, a review and correction of cross sections, and a better treatment of energy and momentum conservation. Concurrent with this development has been a validation program which includes comparisons with double differential cross sections. An ongoing hadronic shower validation will also be discussed which includes the examination of longitudinal shower shapes and the performance of the above models as well as their interaction with electromagnetic processes such as multiple scattering.

NTIS

Hadrons; Electromagnetic Interactions; Models

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20070023929 Government Accountability Office, Washington, DC, USA

Federal Acquisitions and Contracting: Systemic Challenges Need Attention

July 17, 2007; 28 pp.; In English; Original contains black and white illustrations

Report No.(s): GAO-07-1098T; No Copyright; Avail.: CASI: A03, Hardcopy

Given the current fiscal environment, agencies must separate wants from needs to ensure that programs provide the best return on investments. Our work has shown that some agencies budget and allocate resources incrementally, largely based on historical precedents, rather than conducting bottom-up reviews and allocating resources based on agencywide goals. We have also seen examples of agencies using fragmented decision-making processes for acquisition investments. Agency spending actions that would not otherwise be taken based on an objective value and risk assessment and considering available resources, work against good strategic planning. Such spending can circumvent careful planning and divert resources from more critical needs, and can serve to exacerbate our serious long-range fiscal imbalance. Agencies also need to translate their true needs into executable programs by setting realistic and stable requirements, acquiring requisite knowledge as acquisitions proceed through development, and funding programs adequately. However, agencies too often promise capabilities they cannot deliver and proceed to development without adequate knowledge. As a result, programs take significantly longer, cost more than planned, and deliver fewer quantities and different capabilities than promised. Even if more funding were provided, it would not be a solution because wants will usually exceed the funding available. No less important is the need to examine the appropriate circumstances for using contractors and address contract management challenges. Agencies continue to experience poor acquisition outcomes in buying goods and services in part because of challenges in setting contract requirements, using the appropriate contract with the right incentives, and ensuring sufficient oversight. Exacerbating these challenges is the evolving and enlarging role of contractors in performing functions previously carried out by government personnel. Further, while contract management challenges can jeopardize successful acquisition outcomes in normal times, they also take on heightened importance and significantly increase risks in the context of contingency operations such as Afghanistan, Iraq, or Hurricane Katrina. Finally, it is imperative that the federal government develop an accountable and capable workforce, because the workforce is ultimately responsible for strategic planning and management of individual programs and contracts. Yet much of the acquisition workforce s workload and complexity of responsibilities have been increasing without adequate attention to the workforce s size, skills and knowledge, and succession planning. Sustained high-level leadership is needed to set the right tone at the top in order to address acquisition challenges and ultimately, prevent fraud, waste, and abuse.

Derived from text

Contractors; Management Planning; Contract Management; Procurement Management

20070024417 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
A Common Operations Room for DTO, JCG and C2000
Rakhorst-Oudendijk, M. L. W.; teBrake, G. M.; Essens, P. J. M. D.; February 2007; 37 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 013.45431
Report No.(s): TNO-DV-2007-A002; TD2007-0002; Copyright; Avail.: Other Sources

An integrated operations room for C2000, JCG and DTO has been designed. Military and police networks can be managed using a flexible solution based on uniform workplaces and a KVM-gateway for secure and non-secure domains.
Author
Control Equipment; Facilities; Network Control; Computer Networks

20070024439 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Mental Readiness of Teams - Development of a Team Model as a Module for SCOPE
deBruin, R.; Verwijs, C.; vanVliet, A. J.; April 2007; 43 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 013.65023
Report No.(s): TNO-DV2007A140; TD2007-0074; Copyright; Avail.: Other Sources

In this study a model of team functioning was developed for the use in the simulation software SCOPE. This software is developed for predicting operational effectiveness of dismounted soldiers using various physical, biological and cognitive models. Based on scientific literature on teams five factors were identified as most important to team functioning. The relations between these factors and effectiveness of dismounted soldiers were quantified by presenting vignettes to military participants and asking them to judge the expected efficiency of the groups described in the vignettes. The results show that leadership, cohesion, and diversity are most related to effectiveness. It is concluded that the developed model is a useful description of team functioning and can be used to improve the general validity of the SCOPE predictions.
Author
Cohesion; Computerized Simulation; Models; Teams

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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*.

20070023771 Missile Defense Agency, Washington, DC USA
Defining Moments: Selected Highlights from 25 Years of Missile Defense Technology Development and Transfer. A Technology Applications Report
May 23, 2006; 114 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465858; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465858

Providing a defense against ballistic missiles has required an immense research effort. However, with the help of the Missile Defense Agency's Technology Applications program, the research for the common defense is also being applied to promote the general welfare. Many key technologies needed for missile defense are benefiting everyday lives. High-power laser technology, conceived in the early days of the Strategic Defense Initiative to knock down missiles, is being used in medical treatments. Electronics that use materials called wide-bandgap semiconductors were pioneered for advanced radar systems and are now essential to modern communications equipment from satellites to cell phones. These new semiconductor devices are even being used in new, brighter and more reliable traffic lights and next-generation DVD players. Advanced communications systems, such as fiber optics, diode and tunable lasers, optical amplifiers and switches, and communication protocols, were also focused research efforts because of the massive amount of data to be transferred between missile defense radars, sensors, and command locations. Today, many communications technologies such as code division multiple access (CDMA), which is used in cell phone systems worldwide, owe part of their success to missile defense research. There are many stories of successfully commercialized missile defense technologies that now serve the common good. These stories, along with more than 500 success stories that have been told in other Technology Applications program publications, illustrate why missile defense research is not conducted in a vacuum of simply providing for the 'common defense.' The Technology Applications program has been striving to ensure that these technologies also advance the 'general welfare.' This report is

divided into three sections: Cold War, 1980-1989; Changing Times, 1990-1999; and The Modern Era, 1999-2005 and Beyond.
DTIC
Antimissile Defense; Missile Defense; Technology Transfer; Technology Utilization

20070023779 Scientific and Industrial Research (SINTEF), Oslo, Norway
MACCIS 2.0 - An Architecture Description Framework for Technical Infostructures and Their Enterprise Environment
Elvesaeter, Brian; Neple, Tor; Aagedal, Jan O; Rolfsen, Rolf K; Stensli, Ole-Oevind; Jun 2004; 49 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465891; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465891

This paper presents the MACCIS 2.0 framework. MACCIS is an architecture description framework that defines architectural artefacts that are used to describe technical information infrastructures (infostructures) and their enterprise environment. The MACCIS framework has been developed for the Norwegian Defense Logistics Organization (NDLO) and its intended use is to describe the architectures of C2IS systems and their C2 environments. MACCIS 2.0 is a framework that is built on standards and experiences from more than five years of framework development and use. The framework contains two parts with different foci; MACCIS 2.0 Infostructure Edition (M2IE) is concerned with descriptions of technical infostructures, while MACCIS 2.0 Enterprise Edition (M2EE) is concerned with descriptions of the enterprise environment of the infostructures. In addition to identifying architectural artefacts, MACCIS also contains guidelines for how to produce and document the architectural artefacts. The UML modelling language with standard extensions mechanisms is used to define the notation for the architecture descriptions. This paper also summarizes some of the experiences that have been made using MACCIS in projects within the NDLO.
DTIC
Command and Control; Computer Networks

20070023782 Teleplan AS, Lysakar, Norway
Network Centric Information Structure - Crisis Information Management
Aarholt, Eldar; Berg, Olav; Jun 2004; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465902; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465902

This paper presents a generic Network Centric Information Structure (NCIS) that can be used by civilian, military and public sectors, and that supports information handling applied to crises management and emergency response. The top level requirements specification for such a network centric based system adapted to collect, handle and distribute important information is presented together with a suggested layout of a network centric demonstrator that supports the information management during emergency and crisis. The paper presents a prioritized set of important information elements that would be of value during a crisis or a rescue mission. It suggests how the information should be collected, stored and distributed, and it suggests information distribution methods supporting a network centric information structure concept. The work is funded by Teleplan and the Norwegian Research Council.
DTIC
Emergencies; Information Management; Information Systems; Management Methods

20070023793 Israel Defense Forces, Tel Aviv, Israel
Mission Oriented C2: Command and Control Systems as Knowledge Systems
Jencmen, Avi; Uziel, Amir; Jun 2004; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465955; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465955

This article explores a new approach for developing command and control systems suited for the information age: a mission oriented approach. The article will present a method of solving the information overflow problem burdening commanders in the battlefield. A mission oriented system contains the operational knowledge as a collection of missions; each mission displays all information relevant to the mission, presented in stages, thus allowing the user to advance along the mission. By presenting the information in the context of a mission, the commander will get only the information needed to complete his operational tasks. A mission oriented system will provide a framework in which distributed forces around the battlespace could build a common situation picture. The common situation picture is built jointly all through the mission and

is updated constantly by the users who share the mission. This is the common language shared by the mission participants; on its basis, they will manage reality in a synchronized fashion. C2 systems development established around the idea of the mission will allow C2 systems to focus on the knowledge the users need instead of focusing on managing the information the systems have.
DTIC
Command and Control; Information Management

20070023796 ViTel Net, Mc Lean, VA USA
Secure Wireless Military Healthcare Telemedicine Enterprise System
Lucas, Kenneth; Dec 2006; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-01-2-0048
Report No.(s): AD-A465969; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465969

The emerging nature of telemedicine is an environment in which health care providers seek to share a vast array of medical information which is captured, disseminated, and displayed in a variety of modalities ranging from email to high resolution imagery and real time video teleconferencing. In theory clinicians should be able to select and use the information modalities and electronic medical record systems they prefer, with the technical systems integration issues of information discourse among disparate sources being transparent. The primary objective is to develop a first responder device for collection of ECG and wound data, transmitting that data wirelessly to a central medical collection point where the data is interpreted and used to remotely direct the treatment of the patient prior to and during medical evacuation. Data once received at the central location must be merged with the patient's record stored in the Hospital Information System (HIS). The merging process will require the development of an interface engine that will allow the collected data to be transferred to the patient's record within the HIS. A commercial-off-the-shelf (COTS) telemedicine integration tool will be used for the rapid configuration and dynamic integration of medical data collection instruments and medical information systems.
DTIC
Information Systems; Medical Services; Telemedicine

20070024448 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Daily Planet Redesign: eZ Publish Web Content Management Implementation
Dutra, Jayne E.; June 22, 2006; In English; eZ Publish Annyal Users Conference, 22 Jun. 2006, Skien, Norway; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40105

This viewgraph presentation reviews the process of the redesign of the Daily . Planet news letter as a content management implementation project. This is a site that is an internal news site that acts as a communication vehicle for a large volume of content. The Objectives for the site redesign was: (1) Clean visual design, (2) Facilitation of publication processes, (3) More efficient maintenance mode, (4) Automated publishing to internal portal, (5) Better navigation through improved site IA, (6) Archiving and retrieval functionality, (7) Back to basics on fundamental business goals. The CM is a process not a software package
CASI
Information Retrieval; News; Information Dissemination; Websites; Searching

20070024464 Royal Australian Air Force, Canberra, Australia
Model-Based Military Scenario Management for Defense Capability
Gori, Ronnie; Chen, Pin; Pozgay, Angela; Jun 2004; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A465896; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA465896

Capability related work is a core area for Defense, and scenarios, in their many forms, are used in much of this work. This paper describes initial work towards the development of an information model that links scenario and capability related information, and the results of capability analysis and experimentation. The intention is to develop the information model so that it may serve as the basis for a Defense capability knowledge management system and hence as a means of integrating experimentation with Defense capability development.
DTIC
Military Operations; Models; Defense Program

20070024701 Lawrence Livermore National Lab., Livermore, CA USA, California Univ., Oakland, CA, USA
Parallel-Aware, Dedicated Job Co-Scheduling Method and System
Jones, T. R., Inventor; Watson, P. C., Inventor; Tuel, W., Inventor; Brenner, L., Inventor; Caffrey, P., Inventor; 15 Nov 04; 18 pp.; In English
Contract(s)/Grant(s): DE-W-7405-ENG-48
Patent Info.: Filed Filed 15 Nov 04; US-Patent-Appl-SN-10-989-704
Report No.(s): PB2007-102618; No Copyright; Avail.: CASI: A03, Hardcopy

In a parallel computing environment comprising a network of SMP nodes each having at least one processor, a parallel-aware co-scheduling method and system for improving the performance and scalability of a dedicated parallel job having synchronizing collective operations. The method and system uses a global co-scheduler and an operating system kernel dispatcher adapted to coordinate interfering system and daemon activities on a node and across nodes to promote intra-node and inter-node overlap of said interfering system and daemon activities as well as intra-node and inter-node overlap of said synchronizing collective operations. In this manner, the impact of random short-lived interruptions, such as timer-decrement processing and periodic daemon activity, on synchronizing collective operations is minimized on large processor-count SPMD bulk-synchronous programming styles.

NTIS
Parallel Processing (Computers); Scheduling; Tasks

20070024904 Federal Bureau of Investigation, Washington, DC, USA
NIBRS Addendum for Submitting LEOKA Data
Oct. 2002; 16 pp.; In English
Report No.(s): PB2007-109528; No Copyright; Avail.: CASI: A03, Hardcopy

In response to the need for an improved collection method of Law Enforcement Officers Killed and Assaulted (LEOKA) data via the National Incident-Based Reporting System (NIBRS), the national Uniform Crime Reporting (UCR) Program recently adopted a new record layout containing three new data elements and a series of new data codes. As of January 1, 2003, the FBI will begin accepting data captured by these new data elements and codes for entry into the 2003 NIBRS Master File for subsequent data analyses and publication. Though this collection eliminates the use of Form 1-705, Law Enforcement Officers Killed or Assaulted, it does not replace the need to submit the Form 1-701, Analysis of Law Enforcement Officers Killed and Assaulted. The national Program encourages all NIBRS agencies to report LEOKA data in the new NIBRS format. However, the FBI will continue to accept LEOKA data on magnetic media according to the instructions in the LEOKA section of NIBRS Volume 2: Data Submission Specifications (May 1992), pages 36-38, until such time as state and local agencies can meet this guideline. Reporting agencies should note that the LEOKA reporting method, i.e., use of the new NIBRS format (with the new elements) or the original LEOKA data record for NIBRS (specified in Volume 2) must be consistent among all reporting agencies within a state. Therefore, either all or none of the agencies that report NIBRS data within a state must report LEOKA data via the new NIBRS format for the victim segment.This addendum provides new and modified NIBRS data values, entry requirements, error messages, and programming changes to collect LEOKA data in the context of the current NIBRS manuals. New and revised information in the affected excerpts are shown in bold. These changes will be incorporated into future NIBRS publication revisions.

NTIS
Crime; Law (Jurisprudence); Attacking (Assaulting); Data Processing; Police

20070024989 National Inst. of Standards and Technology, Gaithersburg, MD, USA
PIV (Personal Identity Verification) Data Model Test Guidelines. Information Security
Chandramouli, R.; Mehta, K.; Uzamere, P. A.; Simon, D.; Ghadiali, N.; Jul. 2006; 166 pp.; In English
Report No.(s): PB2007-108491; NIST/SP-800-85B; No Copyright; Avail.: CASI: A08, Hardcopy

A robust testing framework and guidance to provide assurance that a particular component or system is compliant with FIPS201 and supporting standards should exist to build the necessary PIV infrastructure to support common unified processes and systems for government-wide use. NIST developed test guidance in two parts. The first part addresses test requirements for interface to the PIV card and are provided in SP80085A. The second part provides test requirements for the PIV data model and is provided in this document. This document specifies the derived test requirements, and the detailed test assertions and conformance tests for testing the PIV data model.

NTIS
Identities; Particle Image Velocimetry; Proving; Punched Cards; Readers

20070024992 National Inst. of Standards and Technology, Gaithersburg, MD, USA
PIV (Personal Identity Verification) Card to Reader Interoperability Guidelines. Information Security
Dray, J. F.; Giles, A.; Kelley, M.; Chandramouli, R.; Sep. 2006; 10 pp.; In English
Report No.(s): PB2007-108485; NIST/SP-800-96; No Copyright; Avail.: CASI: A02, Hardcopy

The purpose of this document is to present recommendations for Personal Identity Verification (PIV) card readers in the area of performance and communications characteristics to foster interoperability. This document is not intended to re-state or contradict requirements specifically identified in Federal Information Processing Standard 201 (FIPS 201) or its associated documents. It is intended to augment existing standards to enable agencies to achieve the interoperability goal of Homeland Security Presidential Directive 12 (HSPD-12). The document provides requirements that facilitate interoperability between any card and any reader. Specifically, the recommendations are for end-point cards and readers designed to read end-point cards.

NTIS
Interoperability; Particle Image Velocimetry; Punched Cards; Identifying; Computer Information Security

20070024995 Government Accountability Office, Washington, DC, USA
Business Systems Modernization: Strategy for Evolving DOD's Business Enterprise Architecture Offers a Conceptual Approach, but Execution Details Are Needed
Apr. 2007; 43 pp.; In English
Report No.(s): PB2007-107935; GAO-07-451; No Copyright; Avail.: CASI: A03, Hardcopy

In 1995, we first designated the Department of Defense's (DOD) business systems modernization program as 'high risk,' and we continue to designate it as such today. To assist in addressing this high-risk area, Congress passed legislation consistent with prior GAO recommendations for Defense to develop a business enterprise architecture (BEA). In September 2006, DOD released version 4.0 of its BEA, which despite improvements over prior versions, was not aligned with component architectures. Subsequently, Defense issued a strategy for extending its BEA to the component military services and defense agencies. To support GAO's legislative mandate to review DOD's BEA, GAO assessed DOD's progress in defining this strategy by comparing it with prior findings and recommendations relevant to the strategy's content. DOD's Business Mission Area federation strategy for extending its BEA to the military departments and defense agencies provides a foundation on which to build and align the department's parent business architecture (the BEA) with its subordinate architectures (i.e., component- and program-level architectures). In particular, the strategy, which was released in September 2006, states the department's federated architecture goals; describes federation concepts that are to be applied; and explains high-level activities, capabilities, products, and services that are intended to facilitate implementation of the concepts. However, the strategy does not adequately define the tasks needed to achieve the strategy's goals, including those associated with executing high-level activities and providing related capabilities, products, and services. Specifically, it does not adequately address how strategy execution will be governed, including assignment of roles and responsibilities, measurement of progress and results, and provision of resources.

NTIS
Commerce; Defense Program; Architecture (Computers)

20070024996 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Guide for Developing Security Plans for Federal Information Systems. Information Security
Swanson, M.; Hash, J.; Bowen, P.; Feb. 2006; 48 pp.; In English
Report No.(s): PB2007-108499; NIST/SP-800-18-R1; No Copyright; Avail.: CASI: A03, Hardcopy

The objective of system security planning is to improve protection of information system resources. All federal systems have some level of sensitivity and require protection as part of good management practice. The protection of a system must be documented in a system security plan. The purpose of the system security plan is to provide an overview of the security requirements of the system and describe the controls in place or planned for meeting those requirements. The system security plan also delineates responsibilities and expected behavior of all individuals who access the system. The system security plan should be viewed as documentation of the structured process of planning adequate, cost-effective security protection for a system. It should reflect input from various managers with responsibilities concerning the system, including information owners, the system owner, and the senior agency information security officer (SAISO). Additional information may be included in the basic plan and the structure and format organized according to agency needs, so long as the major sections described in this document are adequately covered and readily identifiable.

NTIS
Computer Information Security; Information Systems; Security; Warning Systems

20070025024 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Recommended Security Controls for Federal Information Systems. Information Security
Ross, R.; Katzke, S.; Johnson, A.; Swanson, M.; Stoneburner, G.; Dec. 2006; 174 pp.; In English
Report No.(s): PB2007-108498; NIST/SP-800-53-R1; No Copyright; Avail.: CASI: A08, Hardcopy

The selection and employment of appropriate security controls for an information system are important tasks that can have major implications on the operations and assets of an organization as well as the welfare of individuals. Security controls are the management, operational, and technical safeguards or countermeasures prescribed for an information system to protect the confidentiality, integrity, and availability of the system and its information. There are several important questions that should be answered by organizational officials when addressing the security considerations for their information systems: What security controls are needed to adequately protect the information systems that support the operations and assets of the organization in order for that organization to accomplish its assigned mission, protect its assets, fulfill its legal responsibilities, maintain its day-to-day functions, and protect individuals. Have the selected security controls been implemented or is there a realistic plan for their implementation. What is the desired or required level of assurance (i.e., grounds for confidence) that the selected security controls, as implemented, are effective in their application. The answers to these questions are not given in isolation but rather in the context of an effective information security program for the organization that identifies, controls, and mitigates risks to its information and information systems. The security controls defined in Special Publication 800-53 and recommended for use by organizations in protecting their information systems should be employed in conjunction with and as part of a well-defined and documented information security program.
NTIS
Computer Information Security; Control Systems Design; Security

20070025025 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Recommended Security Controls for Federal Information Systems: High-Impact Baseline. Information Security. Annex 3
Dec. 2006; 75 pp.; In English
Report No.(s): PB2007-108497; No Copyright; Avail.: CASI: A04, Hardcopy

Organizations are expected to apply the tailoring guidance described in Section 3.3 of NIST Special Publication 800-53 to the initial high-impact baseline security controls producing a tailored baseline. The tailored security control baseline serves as the starting point for organizations in determining the appropriate safeguards and countermeasures necessary to protect their information systems. Supplements to the tailored baseline (see Section 3.4 of NIST Special Publication 800-53) will likely be necessary in order to adequately mitigate risks to organizational operations (including mission, functions, image, and reputation), organizational assets, and individuals. The tailored baseline is supplemented based on an organizational assessment of risk with the supplemented baseline documented in the security plan for the information system. The supplemented security control baseline, along with any information system use restrictions required to achieve adequate risk mitigation, represents the organizations definition for information system security due diligence.
NTIS
Computer Information Security; Information Systems; Security

20070025026 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography. Computer Security
Barker, E.; Johnson, D.; Smid, M.; Mar. 2006; 116 pp.; In English
Report No.(s): PB2007-108494; NIST/SP-800-56A; No Copyright; Avail.: CASI: A06, Hardcopy

This recommendation specifies key establishment schemes using discrete logarithm cryptography, based on standards developed by the Accredited Standards Committee (ASC) X9, Inc.: ANS X9.42 (Agreement of Symmetric Keys Using Discrete Logarithm Cryptography) and ANS X9.63 (Key Agreement and Key Transport Using Elliptic Curve Cryptography).
NTIS
Computer Information Security; Cryptography; Logarithms

20070025028 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Information Security Guide for Government Executives
Bowen, P.; Chew, E.; Hash, J.; Jan. 2007; 19 pp.; In English
Report No.(s): PB2007-108496; NISTIR-7359; No Copyright; Avail.: CASI: A03, Hardcopy

Information Security for Government Executives provides a broad overview of information security program concepts to

assist senior leaders in understanding how to oversee and support the development and implementation of information security programs. Executives are responsible for: Establishing the organizations information security program; Setting program goals and priorities that support the mission of the organization; and making sure resources are available to support the program and make it successful. Senior leadership commitment to security is more important now than ever before. Studies have shown that senior managements commitment to information security initiatives is the single most critical element that impacts an information security programs success. Meeting this need necessitates senior leadership to focus on effective information security governance and support which requires integration of security into the strategic and daily operations of an organization. When considering this challenge, several key security questions emerge for the executive: Why do I need to invest in information security. Where do I need to focus my attention in accomplishing critical information security goals. What are the key activities to build an effective information security program. What are the information security laws, regulations, standards, and guidance that I need to understand to build an effective information security program. Where can I learn more to assist me in evaluating the effectiveness of my information security program. This guide provides the answers to those questions.
NTIS
Computer Information Security; Security

20070025031 National Inst. of Standards and Technology, Gaithersburg, MD, USA
Guidelines for Media Sanitization: Recommendations of the National Institute of Standards and Technology. Computer Security
Kissel, R.; Scholl, M.; Skolochenko, S.; Li, X.; Sep. 2006; 43 pp.; In English
Report No.(s): PB2007-108495; NIST/SP-800-88; No Copyright; Avail.: CASI: A03, Hardcopy

Information systems capture, process, and store information using a wide variety of media. This information is not only located on the intended storage media but also on devices used to create, process, or transmit this information. These media may require special disposition in order to mitigate the risk of unauthorized disclosure of information and to ensure its confidentiality. Efficient and effective management of information that is created, processed, and stored by an information technology (IT) system throughout its life, from inception through disposition, is a primary concern of an information system owner and the custodian of the data.
NTIS
Computer Information Security; Communication

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20070023945 Government Accountability Office, Washington, DC, USA
Environmental Satellite Acquisitions: Progress and Challenges
July 11, 2007; 36 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

Both the NPOESS and GOES-R satellite acquisitions are costly, technically complex, and critically important to weather forecasting and climate monitoring. NPOESS was originally estimated to cost about $6.5 billion over the 24-year life of the program, with its first satellite launch planned for April 2009. Over the last few years, NPOESS experienced escalating costs, schedule delays, and technical difficulties. These factors led to a June 2006 decision to restructure the program thereby decreasing the program s complexity by reducing the number of sensors and satellites, increasing its estimated cost to $12.5 billion, and delaying the launches of the first two satellites to 2013 and 2016 (see table below). Since that time, the program office has made progress in restructuring the satellite acquisition and establishing an effective management structure; however, important tasks remain to be done and significant risks remain. The GOES-R acquisition, originally estimated to cost $6.2 billion and scheduled to have the first satellite ready for launch in 2012, is at a much earlier stage in its life cycle than NPOESS. In September 2006, GAO reported that the National Oceanic and Atmospheric Administration (NOAA) had issued contracts for the preliminary design of the overall GOES-R system to three vendors and expected to award a contract to one of these vendors in August 2007 to develop the satellites. However, analyses of GOES-R cost -- which in May 2006 was estimated to reach $11.4 billion -- led the agency, in September 2006, to reduce the program s scope from four to two satellites and to discontinue one of the critical sensors. Program officials now report that they are reevaluating that decision and may further revise the scope and requirements of the program in coming months. GAO also reported that NOAA had taken steps

to implement lessons learned from past satellite programs, but more remained to be done to ensure sound cost estimates and adequate system engineering capabilities. GAO currently has work under way to evaluate GOES-R risks and challenges.
Author
Cost Estimates; GOES Satellites; Meteorological Satellites; Financial Management; Cost Analysis

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

20070024868 NASA, Washington, DC, USA
Aeronautics and Space Report of the President: Fiscal Year 2005 Activities
[2007]; 117 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/NP-2007-03-465-HQ; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024868

The National Aeronautics and Space Act of 1958 directed the annual Aeronautics and Space Report to include a 'comprehensive description of the programmed activities and the accomplishments of all agencies of the USA in the field of aeronautics and space activities during the preceding calendar year.' In recent years, the reports have been prepared on a fiscal-year basis, consistent with the budgetary period now used in programs of the Federal Government. This year's report covers activities that took place from October 1 , 2004, through September 30, 2005.
Author
Aeronautics; Space Exploration; Presidential Reports; Astronautics; NASA Space Programs; Defense Program

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*.

20070025010 British National Space Centre, London, UK
Space:UK, June 2007, Issue 22
Bibi, Azara, Editor; June 2007; 28 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

In this edition, we take a close look at the evidence for polar meltdown and the global threat of climate change. Also, in the first of a new series of interviews with well-known people, space.uk talks to Alex James, member of Britpop band Blur an successful solo musician, about art, music and cosmology. As part of the 50th anniversary of spaceflight this year, there is an article about the illustrious past and promising future of Jodrell Bank Observatory's famous Lovell telescope. Plus, there are articles about the ambitious BepiColombo mission to Mercury and celebrate British space exploration with the newly updated London Science Museum's space gallery.
Derived from text
Space Exploration; Space Flight; United Kingdom

20070025091 NASA Johnson Space Center, Houston, TX, USA
Clean Assembly of Genesis Collector Canister for Flight: Lessons for Planetary Sample Return
Allton, J. H.; Stansbery, E. K.; Allen, C. C.; Warren, J. L.; Schwartz, C. M.; September 17, 2007; 1 pp.; In English; Discovery\@15, 19-20 Sep. 2007, Huntsville, AL, USA; Copyright; Avail.: Other Sources; Abstract Only

Measurement of solar composition in the Genesis collectors requires not only high sensitivity but very low blanks; thus, very strict collector contamination minimization was required beginning with mission planning and continuing through hardware design, fabrication, assembly and testing. Genesis started with clean collectors and kept them clean inside of a canister. The mounting hardware and container for the clean collectors were designed to be cleanable, with access to all surfaces for cleaning. Major structural components were made of aluminum and cleaned with megasonically energized ultrapure water (UPW). The UPW purity was >18 M resistivity. Although aluminum is relatively difficult to clean, the Genesis protocol achieved level 25 and level 50 cleanliness on large structural parts; however, the experience suggests that surface treatments may be helpful on future missions. All cleaning was performed in an ISO Class 4 (Class 10) cleanroom immediately adjacent to an ISO Class 4 assembly room; thus, no plastic packaging was required for transport. Persons assembling the

canister were totally enclosed in cleanroom suits with face shield and HEPA filter exhaust from suit. Interior canister materials, including fasteners, were installed, untouched by gloves, using tweezers and other stainless steel tools. Sealants/lubricants were not exposed inside the canister, but vented to the exterior and applied in extremely small amounts using special tools. The canister was closed in ISO Class 4, not to be opened until on station at Earth-Sun L1. Throughout the cleaning and assembly, coupons of reference materials that were cleaned at the same time as the flight hardware were archived for future reference and blanks. Likewise reference collectors were archived. Post-mission analysis of collectors has made use of these archived reference materials.
Author
Sample Return Missions; Mission Planning; Samplers; Surface Treatment; Structural Design; Contamination

20070025092 NASA Johnson Space Center, Houston, TX, USA
Genesis Contingency Planning and Mishap Recovery: The Sample Curation View
Stansbery, E. K.; Allton, J. H.; Allen, C. C.; McNamara, K. M.; Calaway, M.; Rodriques, M. C.; September 19, 2007; 1 pp.; In English; Discovery\@15 Lessons Learned, 19-20 Sep. 2007, Huntsville, AL, USA
Contract(s)/Grant(s): 134857.04.04; Copyright; Avail.: Other Sources; Abstract Only

Planning for sample preservation and curation was part of mission design from the beginning. One of the scientific objectives for Genesis included collecting samples of three regimes of the solar wind in addition to collecting bulk solar wind during the mission. Collectors were fabricated in different thicknesses for each regime of the solar wind and attached to separate frames exposed to the solar wind during specific periods of solar activity associated with each regime. The original plan to determine the solar regime sampled for specific collectors was to identify to which frame the collector was attached. However, the collectors were dislodged during the hard landing making identification by frame attachment impossible. Because regimes were also identified by thickness of the collector, the regime sampled is identified by measuring fragment thickness. A variety of collector materials and thin films applied to substrates were selected and qualified for flight. This diversity provided elemental measurement in more than one material, mitigating effects of diffusion rates and/or radiation damage. It also mitigated against different material and substrate strengths resulting in differing effects of the hard landing. For example, silicon crystal substrates broke into smaller fragments than sapphire-based substrates and diamond surfaces were more resilient to flying debris damage than gold. The primary responsibility of the curation team for recovery was process documentation. Contingency planning for the recovery phase expanded this responsibility to include not only equipment to document, but also gather, contain and identify samples from the landing area and the recovered spacecraft. The team developed contingency plans for various scenarios as part of mission planning that included topographic maps to aid in site recovery and identification of different modes of transport and purge capability depending on damage. A clean tent, set-up at Utah Test & Training Range to control the environment for processing the sample return capsule and cleanly installing a nitrogen purge to the canister, was used to control the environment for extracting collector fragments from the damaged canister and to document and package over 10,000 collector fragments.
Author
Sample Return Missions; Mission Planning; Samplers; Collection; Preserving; Radiation Damage

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20070023715 Consiglio Nazionale delle Ricerche, Rome, Italy, Naval Research Lab., Washington, DC USA
The Far-Infrared Emission Line and Continuum Spectrum of the Seyfert Galaxy NGC 1068
Spinoglio, Luigi; Malkan, Matthew A; Smith, Howard A; Gonzalez-Alfonso, Eduardo; Fischer, Jacqueline; Astrophysical Journal; Apr 10, 2005; Volume 623, pp. 123-136; In English
Contract(s)/Grant(s): NASA LTSA S-92521-F; NAG5-10659
Report No.(s): AD-A461551; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/100.2/ADA461551

We report on the analysis of the first complete far-infrared spectrum (43 197 m) of the Seyfert 2 galaxy NGC 1068 as observed with the > Long Wavelength Spectrometer (LWS) on board the Infrared Space Observatory (ISO). In addition to the seven expected ionic fine-structure emission lines, the OH rotational lines at 79, 119, and 163 micron were all detected in emission, which is unique among galaxies with full LWS spectra, where the 119 micron line, when detected, is always in

absorption. The observed line intensities were modeled together with ISO Short Wavelength Spectrometer (SWS) and optical and ultraviolet line intensities from the literature, considering two independent emission components: the active galactic nucleus (AGN) component and the starburst component in the circumnuclear ring of approximately 3 kpc in size. Using the UV to mid-IR emission line spectrum to constrain the nuclear ionizing continuum, we have confirmed previous results: a canonical power-law ionizing spectrum is a poorer fit than one with a deep absorption trough, while the presence of a > 'big blue bump' is ruled out. Based on the instantaneous starburst age of 5 Myr constrained by the Br equivalent width in the starburst ring, and starburst synthesis models of the mid- and far-infrared fine-structure line emission, a low-ionization parameter (U = 10 (exp 3.5)) and low densities (n = 100/cu cm) are derived. Combining the AGN and starburst components, we succeeded in modeling the overall UV to far-IR atomic spectrum of NGC 1068, reproducing the line fluxes to within a factor of 2.0 on average with a standard deviation of 1.3, and the overall continuum as the sum of the contribution of the thermal dust emission in the ionized and neutral components. The OH 119 micron emission indicates that the line is collisionally excited and arises in a warm and dense region. The OH emission has been modeled using spherically symmetric, nonlocal, non-LTE radiative transfer models. The models indicate that the bulk of the emission arises from the nuclear region, although some extended contribution from the starburst is not ruled out. The OH abundance in the nuclear region is expected to be approximately 10(exp -5) characteristic of X-ray-dominated regions.
Author
Continuous Spectra; Continuum Mechanics; Emission Spectra; Far Infrared Radiation; Seyfert Galaxies; Ultraviolet Astronomy; Infrared Astronomy; Active Galactic Nuclei; Infrared Spectra

20070024466 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Update on the Wide-field Infrared Survey Explorer (WISE)
Mainzer, Amanda K.; Eisenhardt, Peter; Wright, Edward L.; Liu, Feng-Chuan; Irace, William; Heinrichsen, Ingolf; Cutri, Roc; Duval, Valerie; May 27, 2006; 13 pp.; In English; Astronomical Telescopes and Instrumentation, 24-30 May 2006, Orland, FL, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39988

The Wide-field Infrared Survey Explorer (WISE), a NASA MIDEX mission, will survey the entire sky in four bands from 3.3 to 23 microns with a sensitivity 1000 times greater than the IRAS survey. The WISE survey will extend the Two Micron All Sky Survey into the thermal infrared and will provide an important catalog for the James Webb Space Telescope. Using 1024(sup 2) HgCdTe and Si:As arrays at 3.3, 4.7, 12 and 23 microns, WISE will find the most luminous galaxies in the universe, the closest stars to the Sun, and it will detect most of the main belt asteroids larger than 3 km. The single WISE instrument consists of a 40 cm diamond-turned aluminum afocal telescope, a two-stage solid hydrogen cryostat, a scan mirror mechanism, and reimaging optics giving 5 resolution (full-width-half-maximum). The use of dichroics and beamsplitters allows four color images of a 47' x47' field of view to be taken every 8.8 seconds, synchronized with the orbital motion to provide total sky coverage with overlap between revolutions. WISE will be placed into a Sun-synchronous polar orbit on a Delta 7320-10 launch vehicle. The WISE survey approach is simple and efficient. The three-axis-stabilized spacecraft rotates at a constant rate while the scan mirror freezes the telescope line of sight during each exposure. WISE has completed its mission Preliminary Design Review and its NASA Confirmation Review, and the project is awaiting confirmation from NASA to proceed to the Critical Design phase. Much of the payload hardware is now complete, and assembly of the payload will occur over the next year. WISE is scheduled to launch in late 2009; the project web site can be found at www.wise.ssl.berkeley.edu.
Author
Astronomical Observatories; Sky Surveys (Astronomy); Wide Angle Lenses; Infrared Astronomy; Spacecraft Design; NASA Space Programs

20070024468 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Water Vapor Measurement and Compensation in the Near and Mid-infrared with the Keck Interferometer Nuller
Koresko, Chris D.; Colavita, Mark M.; Serabyn, Eugene; Booth, Andrew; Garcia, Jean I.; July 2006; 7 pp.; In English; SPIE 50th Annual Conference, 31 Jul. - 4 Aug. 2006, San Diego, CA, USA; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40018

A viewgraph presentation describing the methods, motivation and methods for water vapor measurement with the Keck interferometer near and mid infrared radiation band is shown. The topics include: 1) Motivation: Why measure H2O?;

2) Method: How do we measure H2O?; 3) Data: Phase and Group Delays for the K and N Bands; 4) Predicted and Actual Nband Phase and Dispersion; and 5) Validation of Atmospheric Turbulence Models with KI Data.
CASI
Astronomical Interferometry; Near Infrared Radiation; Water Vapor; Null Zones

20070024987 Stanford Linear Accelerator Center, CA, USA
Dark Matter Searches with GLAST (February 2007)
Wai, L.; Feb. 2007; 4 pp.; In English
Report No.(s): DE2007-899208; SLAC-PUB-12338; No Copyright; Avail.: Department of Energy Information Bridge

Indirect detection of particle dark matter relies upon pair annihilation of Weakly Interaction Massive Particles (WIMPs), which is complementary to the well known techniques of direct detection (WIMP-nucleus scattering) and collider production (WIMP pair production). Pair annihilation of WIMPs results in the production of gamma-rays, neutrinos, and anti-matter. Of the various experiments sensitive to indirect detection of dark matter, the Gamma-ray Large Area Space Telescope (GLAST) may play the most crucial role in the next few years. After launch in late 2007, The GLAST Large Area Telescope (LAT) will survey the gamma-ray sky in the energy range of 20MeV- 300GeV. By eliminating charged particle background above 100 MeV, GLAST may be sensitive to as yet to be observed Milky Way dark matter subhalos, as well as WIMP pair annihilation spectral lines from the Milky Way halo. Discovery of gamma-ray signals from dark matter in the Milky Way would not only demonstrate the particle nature of dark matter; it would also open a new observational window on galactic dark matter substructure. Location of new dark matter sources by GLAST would dramatically alter the experimental landscape; ground based gamma ray telescopes could follow up on the new GLAST sources with precision measurements of the WIMP pair annihilation spectrum.
NTIS
Cosmic Rays; Dark Matter; Gamma Rays; Hubble Space Telescope

20070024991 Stanford Linear Accelerator Center, CA, USA
Search for Milky Way Halo Substructure WIMP Annihilations using the GLAST LAT
Wai, L.; Feb. 2007; 4 pp.; In English
Report No.(s): DE2007-899209; SLAC-PUB-12339; No Copyright; Avail.: Department of Energy Information Bridge

The GLAST LAT Collaboration is one among several experimental groups, covering a wide range of approaches, pursuing the search for the nature of dark matter. The GLAST LAT has the unique ability to find new sources of high energy gamma radiation emanating directly from WIMP annihilations in situ in the universe. Using its wide band spectral and full sky spatial capabilities, the GLAST LAT can form images in high energy gamma-rays of dark matter substructures in the gamma- ray sky. We describe a preliminary feasibility study for indirect detection of milky way dark matter satellites using the GLAST LAT.
NTIS
Annihilation Reactions; Dark Matter; Halos; Hubble Space Telescope; Milky Way Galaxy; Substructures

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20070023748 NASA Ames Research Center, Moffett Field, CA, USA
Warm Molecular Gas Traced with CO J = 7 --> 6 in the Galaxy's Central 2 Parsecs: Dynamical Heating of the Circumnuclear Disks
Bradford, C. M.; Stacey, G. J.; Nikola, T.; Bolatto, A. D.; Jackson, J. M.; Savage, M. L.; Davidson, J. A.; Astrophysical Journal; April 20, 2005; Volume 623, pp. 866-876; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39310

We present an 11' resolution map of the central 2 pc of the Galaxy in the CO J = 7 --> 6 rotational transition. The CO emission shows rotation about Sgr A* but also evidence for noncircular turbulent motion and a clumpy morphology. We combine our data set with available CO measurements to model the physical conditions in the disk. We find that the molecular gas in the region is both warm and dense, with T approx. 200-300 K and n(sub H2) approx. (5-7) x 10(exp 4) cm(exp -3). The mass of warm molecular gas we measure in the central 2 pc is at least 2000 M(solar), about 20 times the UV-excited

atomic gas mass, ruling out a UV heating scenario for the molecular material. We compare the available spectral tracers with theoretical models and conclude that molecular gas is heated with magnetohydrodynamic shocks with v approx. 10-20 km s(exp -1) and B approx. 0.3- 0.5 mG. Using the conditions derived with the CO analysis, we include the other important coolants, neutral oxygen and molecular hydrogen, to estimate the total cooling budget of the molecular material. We derive a mass-to-luminosity ratio of approx. 2-3 M(solar)(L(solar)exp -1), which is consistent with the total power dissipated via turbulent decay in 0.1 pc cells with v(sub rms) approx. 15 kilometers per second. These size and velocity scales are comparable to the observed clumping scale and the velocity dispersion. At this rate, the material near Sgr A* is dissipating its orbital energy on an orbital timescale and cannot last for more than a few orbits. Our conclusions support a scenario in which the features near Sgr A* such as the circumnuclear disk and northern arm are generated by infalling clouds with low specific angular momentum.
Author
Molecular Gases; Disk Galaxies; Spatial Resolution; Astrophysics; Galactic Nuclei; Magnetohydrodynamics

20070024428 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Gamma-Ray Spectral State Transitions of GRO J1719-24
Ling, J. C.; Wheaton, William A.; The Astrophysical Journal; March 20, 2005; Volume 622, pp. 492-502; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40084

We report the results of an in-depth study of the long-term soft gamma-ray (30 keV to 1.7 MeV) flux and spectral variability of the transient source GRO J1719-24 that was first discovered by BATSE and SIGMA in the fall of 1993. Our results were obtained from the JPL BATSE-EBOP database covering a 1000 day period between 1993 January 13 and 1995 October 10. During this period, the source underwent a major outburst in the fall of 1993 when the 35-100 keV flux rose from a quiescent state of less than 16 mcrab before 1993 September 17 to a level of 1.5 crab on October 3. The source remained in this high-intensity state over the next approx. 70 days, during which the 35-100 keV flux decreased monotonically by 33% to 1 crab on December 12, then decreased sharply to the pretransition quiescent level of 44 mcrab on December 21, where it remained until 1994 September 5. During a 400 day period between 1994 September 5 and 1995 October 10, the source again underwent a series of five transitions when the 35-100 keV flux increased to low-intensity levels of 200 400 mcrab, a factor of 4-7 times lower than what was observed in 1993. The low- and high-intensity states were characterized by two different spectral shapes. The low-state spectra are described by a power law with a spectral index of approx. 2. The high-state spectra, on the other hand, have two components: a thermal Comptonized shape below approx. 200 keV with electron temperature k(sub Te) of approx. 37 keV and optical depth tau approx. 2.8, and a soft power-law tail with photon index of 3.4 above 200 keV that extends to approx. 500 keV. The softer high-intensity spectrum and the harder low-intensity spectrum intersect at approx. 400 keV. The nonthermal power-law gamma-ray component in both the high- and low-intensity spectra suggests that the persistent nonthermal emission source is coupled to the hot and variable thermal emission source in the system. Furthermore, the correlation of the spectral characteristics with the high- and low-intensity states resembles that seen in two other gamma-ray emitting black hole candidates, GRO J0422+32 and Cygnus X-1, suggesting that perhaps similar system configurations and processes are occurring in these systems. Possible scenarios for interpreting these behaviors are discussed.
Author
Black Holes (Astronomy); Gamma Ray Bursts; Gamma Ray Observatory; Gamma Ray Spectra; Electron Transitions; Electron States

20070024430 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
HEALPix: A Framework for High-Resolution Discretization and Fast Analysis of Data Distributed on the Sphere
Gorski, K. M.; Hivon, Eric; Banday, A. J.; Wandelt, Benjamin D.; Hansen, Frode K.; Reinecke, Mstvos; Bartelmann, Matthia; The Astrophysical Journal; April 2005; Volume 622, Issue 2, pp. 759-771; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40082; http://dx.doi.org/10.1086/427976

HEALPix the Hierarchical Equal Area isoLatitude Pixelization is a versatile structure for the pixelization of data on the sphere. An associated library of computational algorithms and visualization software supports fast scientific applications executable directly on discretized spherical maps generated from very large volumes of astronomical data. Originally developed to address the data processing and analysis needs of the present generation of cosmic microwave background experiments (e.g., BOOMERANG, WMAP), HEALPix can be expanded to meet many of the profound challenges that will arise in confrontation with the observational output of future missions and experiments, including, e.g., Planck, Herschel,

SAFIR, and the Beyond Einstein inflation probe. In this paper we consider the requirements and implementation constraints on a framework that simultaneously enables an efficient discretization with associated hierarchical indexation and fast analysis/synthesis of functions defined on the sphere. We demonstrate how these are explicitly satisfied by HEALPix.
Author
Data Processing; High Resolution; Spheres; Pixels; Hierarchies; Spherical Harmonics; Algorithms

20070024432 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Sculpting a Pre-Planetary Nebula with a Precessing Jet: IRAS 16342-3814
Sahai, R.; Le Mignant, D.; Sanchez Contreras, C.; Campbell, R. D.; Chaffee, F. H.; The Astrophysical Journal; March 2005; Volume 622, pp. L53-L56; In English; Original contains color illustrations
Contract(s)/Grant(s): NSF 99-81546; RTOP 399-20-00-08; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40080; http://dx.doi.org/10.1086/429586

We have imaged the bipolar pre-planetary nebula IRAS 16342-3814 with the Keck adaptive optics (AO) system in four near-infrared bands in the 1.6-4.7 (micro)m range. The lobes, which showed smoothly varying brightness distributions in previous optical images taken with the Hubble Space Telescope, have a limb-brightened appearance in the AO images, with a remarkable corkscrew structure inscribed on the lobe walls. A well-collimated, precessing jet with a diameter less than or approximately equal to 100 AU and a precession period less than or approximately equal to 50 yr, interacting with ambient circumstellar material, is most likely responsible for the corkscrew structure and the lobes, as indicated by a detailed comparison of our observations with published numerical simulations. The very red colors of the lobes in the near-infrared, coupled with their visibility at optical wavelengths, require that at least half, but not all, of the light of the central star be trapped by a compact circumstellar dust cloud heated to approximately 600-700 K and reradiated in the infrared. The lobes are thus illuminated both by the infrared light from this dust cloud as well as by the optical light from the central star.
Author
Adaptive Optics; Infrared Astronomy Satellite; Planetary Nebulae; Asymptotic Giant Branch Stars; Astrophysics; Precession

20070024675 Lawrence Livermore National Lab., Livermore, CA USA
Science with Micro-X: the TES Microcalorimeter X-ray Imaging Rocket
Figueroa-Feliciano, E.; Bandler, S. R.; Bautz, M.; Boyce, K. R.; Brown, G. V.; May 25, 2006; 14 pp.; In English
Report No.(s): DE2007-899390; UCRL-PROC-221634; No Copyright; Avail.: National Technical Information Service (NTIS)

Micro-X is a proposed sounding rocket experiment that will combine a transition-edge-sensor X-ray-microcalorimeter array with a conical imaging mirror to obtain high-spectral-resolution images of extended and point X-ray sources. We describe the payload and the science targeted by this mission including the discussion of three possible Micro- X targets: the Puppis A supernova remnant, the Virgo Cluster, and Circinus X-1. For example, a Micro-X observation of the bright eastern knot of Puppis A will obtain a line-dominated spectrum with 90,000 counts collected in 300 seconds at 2 eV resolution across the 0.3-2.5 keV band. Micro-X will utilize plasma diagnostics to determine the thermodynamic and ionization state of the plasma, to search for line shifts and broadening associated with dynamical processes, and seek evidence of ejecta enhancement. For clusters of galaxies, Micro-X can uniquely study turbulence and the temperature distribution function. For binaries, Micro-Xs high resolution spectra will separate the different processes contributing to the Fe K lines at 6 keV and give a clear view of the geometry of the gas flows and circumstellar gas.
NTIS
Calorimeters; Imaging Techniques; X Ray Imagery; X Ray Sources

20070024912 Lawrence Livermore National Lab., Livermore, CA USA, McGill Univ., Montreal, Quebec, Canada, California Univ., Berkeley, CA, USA
Extreme Adaptive Optics for the Thirty Meter Telescope
Macintosh, B.; May 15, 2006; 17 pp.; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): DE2007-898493; UCRL-CONF-221361; No Copyright; Avail.: National Technical Information Service (NTIS)

Direct detection of extrasolar Jovian planets is a major scientific motivation for the construction of future extremely large telescopes such as the Thirty Meter Telescope (TMT). Such detection will require dedicated high-contrast AO systems. Since the properties of Jovian planets and their parent stars vary enormously between different populations, the instrument must be

designed to meet specific scientific needs rather than a simple metric such as maximum Strehl ratio. We present a design for such an instrument, the Planet Formation Imager (PFI) for TMT. It has four key science missions. The first is the study of newly-formed planets on 5-10 AU scales in regions such as Taurus and Ophiucus--this requires very small inner working distances that are only possible with a 30m or larger telescope. The second is a robust census of extrasolar giant planets orbiting mature nearby stars. The third is detailed spectral characterization of the brightest extrasolar planets. The final targets are circumstellar dust disks, including Zodiacal light analogs in the inner parts of other solar systems. To achieve these, PFI combines advanced wavefront sensors, high-order MEMS deformable mirrors, a coronagraph optimized for a finely-segmented primary mirror, and an integral field spectrograph.
NTIS
Adaptive Optics; Planets; Telescopes

20070025043 Molecular Research Inst., Mountain View, CA, USA
Photoionization in Ultraviolet Processing of Astrophysical Ice Analogs at Cryogenic Temperatures
Woon, David E.; Advances in Space Research; 2004; Volume 33, Issue 1, pp. 44-48; In English
Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.asr.2003.07.003

Two recent experimental studies have demonstrated that amino acids or amino acid precursors are generated when astrophysical ice analogs are subjected to ultraviolet (UV) irradiation at cryogenic temperatures. Understanding the complete phenomenology of photoprocessing is critical to elucidating chemical reaction mechanisms that can function within an ice matrix under very cold conditions. Pushing beyond the much better characterized study of photolytic dissociation of chemical bonds through electronic excitation, this work explored the ability of UV radiation present in the interstellar medium to ionize small molecules embedded in ices. Quantum chemical calculations, including bulk solvation effects, were used to study the ionization of hydrogen (H2), water, and methanol (CH3OH) bound in small clusters of water. Ionization potentials were found to be much smaller in the condensed phase than in the gas phase; even a small cluster can account for large changes in the ionization potentials in ice, as well as the known formation of an OH--H3O+ pair in the case of H2O photoionization. To gauge the impact of photoionization on subsequent grain chemistry, the reaction between OH and CO in the presence of H3O+ was studied and compared with the potential energy surface without hydronium present, which is relevant to chemistry following photolysis. The differences indicate that the reaction is somewhat more likely to proceed to products (H + CO2) in the case of photoionization.
Author
Astrophysics; Cryogenic Temperature; Ice; Interstellar Matter; Photoionization; Interstellar Chemistry

20070025045 Molecular Research Inst., Mountain View, CA, USA
Photoionization of Benzene and Small Polycyclic Aromatic Hydrocarbons in Ultraviolet-Processed Astrophysical Ices: A Computational Study
Woon, D. E.; Park, J.-Y.; The Astrophysical Journal; May 20, 2004; Volume 607, Part 1, pp. 342-345; In English
Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1086/383345

We employed density functional theory (DFT) calculations to model the photoionization behavior of benzene and small polycyclic aromatic hydrocarbons when they are embedded in a matrix of water ice in order to investigate issues raised by recent experimental work by Gudipati and Allamandola. The ionization energies of benzene, naphthalene, anthracene, and pyrene were found to be lowered by 1.5-2.1 eV in water ice. Low-lying vertical electronic excitation energies were computed with time-dependent DFT for both neutral and ionized species and are found in both cases to be remarkably unaffected by the ice matrix. Chemical behavior in ultraviolet-photoprocessed ices is also discussed, with a focus on electron recombination and pathways leading to phenol and analogous products.
Author
Benzene; Ice; Photoionization; Polycyclic Aromatic Hydrocarbons; Interstellar Chemistry; Interstellar Matter; Computational Chemistry

20070025047 Molecular Research Inst., Mountain View, CA, USA

Theoretical Investigation of OCN(-) Charge Transfer Complexes in Condensed Phase Media: Spectroscopic Properties in Amorphous Ice

Park, Jin-Young; Woon, David E.; Journal of Physical Chemistry A; August 05, 2004; Volume 108, No. 31, pp. 6589-6598; In English

Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1021/jp048763m

Density functional theory (DFT) calculations of cyanate (OCN(-)) charge-transfer complexes were performed to model the 'XCN' feature observed in interstellar icy grain mantles. OCN(-) charge-transfer complexes were formed from precursor combinations of HNCO or HOCN with either NH3 or H2O. Three different solvation strategies for realistically modeling the ice matrix environment were explored, including (1) continuum solvation, (2) pure DFT cluster calculations, and (3) an ONIOM DFT/PM3 cluster calculation. The model complexes were evaluated by their ability to reproduce seven spectroscopic measurements associated with XCN: the band origin of the OCN(-) asymmetric stretching mode, shifts in that frequency due to isotopic substitutions of C, N, O, and H, plus two weak features. The continuum solvent field method produced results consistent with some of the experimental data but failed to account for other behavior due to its limited capacity to describe molecular interactions with solvent. DFT cluster calculations successfully reproduced the available spectroscopic measurements very well. In particular, the deuterium shift showed excellent agreement in complexes where OCN(-) was fully solvated. Detailed studies of representative complexes including from two to twelve water molecules allowed the exploration of various possible solvation structures and provided insights into solvation trends. Moreover, complexes arising from cyanic or isocyanic acid in pure water suggested an alternative mechanism for the formation of OCN(-) charge-transfer complexes without the need for a strong base such as NH3 to be present. An extended ONIOM (B3LYP/PM3) cluster calculation was also performed to assess the impact of a more realistic environment on HNCO dissociation in pure water.

Author

Charge Transfer; Density Functional Theory; Ice; Cyanates; Interstellar Chemistry; Interstellar Matter

20070025048 Molecular Research Inst., Mountain View, CA, USA

Theoretical Modeling of Formic Acid (HCOOH), Formate (HCOO(-)), and Ammonia (NH(4)) Vibrational Spectra in Astrophysical Ices

Park, Jin-Young; Woon, David E.; The Astrophysical Journal; September 2006; Volume 648, Part 1, pp. 1285-1290; In English

Contract(s)/Grant(s): NAG5-13482; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1086/506175

Ions embedded in icy grain mantles are thought to account for various observed infrared spectroscopic features, particularly in certain young stellar objects. The dissociation of formic acid (HCOOH) in astrophysical ices to form the formate ion (HCOO(-)) was modeled with density functional theory cluster calculations. Like isocyanic acid (HOCN), HCOOH was found to spontaneously deprotonate when sufficient water is present to stabilize charge transfer complexes. Both ammonia and water can serve as proton acceptors, yielding ammonium (NH4(+)) and hydronium (H3O(+)) counterions. Computed frequencies of weak infrared features produced by stretching and bending modes in both HCOO(-) and HCOOH were compared with experimental and astronomical data. Our results confirm laboratory assignments that a band at 1381 cm(exp -1) can be attributed to the CH bend in either HCOO(-) or HCOOH, but a band at 1349 cm(exp -1) corresponds to CO stretching in HCOO(-). Another feature at 1710 cm(exp -1) (5.85 m) can possibly be assigned to a CO stretching mode in HCOOH, as suggested by experiment, but the agreement is less satisfactory. In addition, we examine and analyze spectroscopic features associated with NH+4, both as a counterion to HCOO(-) or OCN(-) and in isolation, in order to compare with experimental and astronomical data in the 7 m region.

Author

Ammonia; Astrophysics; Charge Transfer; Formates; Ice; Interstellar Matter; Interstellar Chemistry

20070025088 NASA Johnson Space Center, Houston, TX, USA

The Physics of the FLUKA Code: Recent Developments

Ballarini, F.; Battistoni, G.; Brugger, M.; Campanella, M.; Carboni, M.; Cerutti, F.; Empl, A.; Fasso, A.; Ferrari, A.; Gadioli, E.; Garzelli, M. V.; Lantz, M.; Mairani, A.; Monstacci, A.; Mostacci, A.; Murano, S.; Ottolenghi, A.; Patera, V.; Pelliccioni, M.; Pinsky, L.; Ranft, J.; Roesler, S.; Sala, P. R.; Scannicchio, D.; Smirnov, G.; July 16, 2007; 19 pp.; In English; 38th COSPAR Meeting, 16-23 Jul. 2007, Beijing, China

Contract(s)/Grant(s): NAG8-1901; Copyright; Avail.: Other Sources

FLUKA is a Monte-Carlo code able to simulate interaction and transport of hadrons, heavy ions and electromagnetic

particles from few keV (or thermal neutron) to cosmic ray energies in whichever material. The highest priority in the design and development of the code has always been the implementation and improvement of sound and modern physical models. A summary of the FLUKA physical models is given, while recent developments are described in detail: among the others, extensions of the intermediate energy hadronic interaction generator, refinements in photon cross sections and interaction models, analytical on-line evolution of radio-activation and remnant dose. In particular, new developments in the nucleus-nucleus interaction models are discussed. Comparisons with experimental data and examples of applications of relevance for space radiation are also provided.
Author
Monte Carlo Method; Nuclear Interactions; Heavy Ions; Dosage; Cosmic Rays; Hadrons; Extraterrestrial Radiation

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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*.

20070023720 NASA Johnson Space Center, Houston, TX, USA
Solar Radiation Pressure Estimation and Analysis of a GEO Class of High Area-to-Mass Ratio Debris Objects
Kelecy, Tom; Payne, Tim; Thurston, Robin; Stansbery, Gene; August 19, 2007; 20 pp.; In English; Astrodynamics Specialists Conference, 19-23 Aug. 2007, Mackinac Island, MI, USA
Report No.(s): AAS -07-391; Copyright; Avail.: CASI: A03, Hardcopy

A population of deep space objects is thought to be high area-to-mass ratio (AMR) debris having origins from sources in the geosynchronous orbit (GEO) belt. The typical AMR values have been observed to range anywhere from 1's to 10's of m(sup 2)/kg, and hence, higher than average solar radiation pressure effects result in long-term migration of eccentricity (0.1-0.6) and inclination over time. However, the nature of the debris orientation-dependent dynamics also results time-varying solar radiation forces about the average which complicate the short-term orbit determination processing. The orbit determination results are presented for several of these debris objects, and highlight their unique and varied dynamic attributes. Estimation or the solar pressure dynamics over time scales suitable for resolving the shorter term dynamics improves the orbit estimation, and hence, the orbit predictions needed to conduct follow-up observations.
Author
Geosynchronous Orbits; Solar Radiation; Space Debris; Mathematical Models; Radiation Pressure; Mass Ratios; Estimating

20070023743 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Small-RPS Enabled Mars Rover Concept
Balint, Tibor S.; February 13, 2004; 14 pp.; In English; Space Technology and Applications International Forum (STAIF-2005), 13-17 Feb. 2004, Albuquerque, NM; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40133

Both the MER and the Mars Pathfinder rovers operated on Mars in an energy-limited mode, since the solar panels generated power during daylight hours only. At other times the rovers relied on power stored in batteries. In comparison, Radioisotope Power Systems (RPS) offer a power-enabled paradigm, where power can be generated for long mission durations (measured in years), independently from the Sun, and on a continuous basis. A study was performed at PL to assess the feasibility of a small-RPS enabled MER-class rover concept and any associated advantages of its mission on Mars. The rover concept relied on design heritage from MER with two significant changes. First, the solar panels were replaced with two single GPHS module based small-RPSs. Second, the Mossbauer spectroscope was substituted with a laser Raman spectroscope, in order to move towards MEPAG defined astrobiology driven science goals. The highest power requirements were contributed to mobility and telecommunication type operating modes, hence influencing power system sizing. The resulting hybrid power system included two small-RPSs and two batteries. Each small-RPS was assumed to generate 50We of power or 62OWh/sol of energy (BOL), comparable to that of MER. The two 8Ah batteries were considered available during peak power usage. Mission architecture, power trades, science instruments, data, communication, thermal and radiation environments, mobility,

mass issues were also addressed. The study demonstrated that a new set of RPS-enabled rover missions could be envisioned for Mars exploration within the next decade, targeting astrobiology oriented science objectives, while powered by 2 to 4 GPHS modules.
Author
Mars Exploration; Mars Surface; Radioisotope Heat Sources; Solar Generators

20070023752 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Considerations Taken in Developing the Frequency Assignment Guidelines for Communications in the Mars Region Provided in SFCG Recommendation 22-1, (SFCG Action Item No. 23/10)
Wang, Charles C.; Peng, Ted; Sue, Miles K.; September 15, 2004; 7 pp.; In English; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40032

In the 23'd Annual SFCG meeting in San Diego, CA, the SFCG created SFCG Action Item No. 23/10 to provide a readable summary of the work done by the Mars Interim Working Group (MIWG). The SFCG created the MIWG to develop a frequency plan for future Mars missions. The working group has produced a number of documents resulting in a recommendation, SFCG Rec 22-1 [1], titled Frequency Assignment Guidelines for Communications in Mars Region, including a frequency plan for the Mars Region. This document is prepared in response to the SFCG Action Item to provide an overview of the considerations taken when selecting the frequencies and to point out where detailed information of the considerations can be found.
Author
Frequency Assignment; Mars Missions; General Overviews; Communication; Onboard Equipment

20070023897 NASA Johnson Space Center, Houston, TX, USA
Science and the Constellation Systems Program Office
Mendell, Wendell; [2007]; 1 pp.; In English; 9th ILEWG International Conference on Exploration and Utilisation of the Moon, 22-26 October 2007, Sorrento, Italy; No Copyright; Avail.: Other Sources; Abstract Only

An underlying tension has existed throughout the history of NASA between the human spaceflight programs and the external scientific constituencies of the robotic exploration programs. The large human space projects have been perceived as squandering resources that might otherwise be utilized for scientific discoveries. In particular, the history of the relationship of science to the International Space Station Program has not been a happy one. The leadership of the Constellation Program Office, created in NASA in October, 2005, asked me to serve on the Program Manager s staff as a liaison to the science community. Through the creation of my position, the Program Manager wanted to communicate and elucidate decisions inside the program to the scientific community and, conversely, ensure that the community had a voice at the highest levels within the program. Almost all of my technical contributions at NASA, dating back to the Apollo Program, has been within the auspices of what is now known as the Science Mission Directorate. However, working at the Johnson Space Center, where human spaceflight is the principal activity, has given me a good deal of incidental contact and some more direct exposure through management positions to the structures and culture of human spaceflight programs. I entered the Constellation family somewhat naive but not uninformed. In addition to my background in NASA science, I have also written extensively over the past 25 years on the topic of human exploration of the Moon and Mars. (See, for example, Mendell, 1985). I have found that my scientific colleagues generally have little understanding of the structure and processes of a NASA program office; and many of them do not recognize the name, Constellation. In many respects, the international ILEWG community is better informed. Nevertheless, some NASA decision processes on the role of science, particularly with respect to the formulation of a lunar surface architecture, are not well known, even in ILEWG. At the recent annual Lunar and Planetary Science Conference, I reviewed the evolution of the program as a function of Agency leadership and the constraints put on NASA by the President in his 2004 announcement. I plan to continue my long-time ILEWG tradition of reporting a personal view of the state of development of human exploration of the solar system, this time coming from within the program office tasked to implement the vision for the USA. The current NASA implementation of the Vision for Space Exploration is consistent with certain classical scenarios that have been discussed extensively in the literature. I will discuss the role of science within the Vision, both from official policy and from a de facto interaction. While science goals are not officially driving the implementation of the Vision, the tools of scientific exploration are integral to defining the extraterrestrial design environments. In this respect the sharing of results from international missions to the Moon can make significant contributions to the success of the future human activities.
Author
Constellation Program; Robotics; Aerospace Sciences; Space Exploration; NASA Programs

20070023905 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mars Exploration Rover Cruise Orbit Determination

Portock, Brian; Baird, Darren; Graat, Eric; Guinn, Joseph; McElrath, Tim; Watkins, Michael; August 17, 2004; 13 pp.; In English; AIAA/AAS Astrodynamics Specialst Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40130

The Mars Exploration Rover project consisted of two missions (MER-A: spirit rover and MER-B: opportunity rover) that launched spacecraft on June 10, 2003, and July 8, 2003, respectively. The spacecraft arrived at Mars approximately seven months later on January 4, 2004, and January 24, 2004. These spacecraft needed to be precisely navigated to a Mars atmospheric entry flight path angle of -11.5 deg +/-0.12 deg (3(sigma)) for MER-A and +/-0.14 deg (3(sigma)) for MER-B in order to satisfy the landing site delivery requirements. The orbit determination task of the navigation team needed to accurately determine the trajectory of the spacecraft, predict the trajectory to Mars atmospheric entry, and account for all possible errors sources so that the each spacecraft could be correctly targeted using five trajectory corrections along the way. This paper describes the orbit determination analysis which allowed MER-A to be targeted using only four trajectory correction maneuvers to an entry flight path angle of -11.49 deg +/-O.010 deg (3(sigma)) and MER-B to be targeted using only three trajectory correction maneuvers to an entry flight path angle of -11.47 +/-0.021 deg(3(sigma)).

Author

Mars Exploration; Orbit Determination; Mars Roving Vehicles; Cruising Flight; Space Missions

20070023926 Field Museum of Natural History, Chicago, IL, USA

The Early Differentiation History of Mars from W-182-Nd-142 Isotope Systematics in the SNC Meteorites

Foley, C. Nicole; Wadhwa, M.; Borg, L. E.; Janney, P. E.; Hines, R.; Grove, T. L.; Geochimica et Cosmochimica Acts; September 15, 2005; ISSN 0016-7037; Volume 69, No. 18, pp. 4557-4571; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAG5-10728; NAG5-12077; NAG5-7196; EAR-97-25659; EAR-98-71154; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1016/j.gca.2005.05.009

We report here the results of an investigation of W and Nd isotopes in the SNC (Shergottite-Nakhlite-Chassignite (martian)) meteorites. We have determined that epsilon W-182 values in the nakhlites are uniform within analytical uncertainties and have an average value of approx. 3. Also, while epsilon W-182 values in the shergottites have a limited range (from 0.3-0.7), their epsilon Nd-142 values vary considerably (from -0.2-0.9). There appears to be no correlation between epsilon W-182 and epsilon Nd-142 in the nakhlites and shergottites. These results shed new light on early differentiation processes on Mars, particularly on the timing and nature of fractionation in silicate reservoirs. Assuming a two-stage model, the metallic core is estimated to have formed at approx. 12 Myr after the beginning of the solar system. Major silicate differentiation established the nakhlite source reservoir before approx. 4542 Ma and the shergottite source reservoirs at 4525 [sup +19 sub -21] Ma. These ages imply that, within the uncertainties afforded by the Hf-182-W-182 and Sm-146-Nd-142 chronometers, the silicate differentiation events that established the source reservoirs of the nakhlites and shergottites may have occurred contemporaneously, possibly during crystallization of a global magma ocean. The distinct W-182-Nd-142 isotope systematics in the nakhlites and the shergottites imply the presence of at least three isotopically distinct silicate reservoirs on Mars, two of which are depleted in incompatible lithophile elements relative to chondrites, and the third is enriched. The two depleted silicate reservoirs most likely reside in the Martian mantle, while the enriched reservoir could be either in the crust or the mantle. Therefore, the W-182-Nd-142 isotope systematics indicate that the nakhlites and the shergottites originated from distinct source reservoirs and cannot be petrogenetically related. A further implication is that the source reservoirs of the nakhlites and shergottites on Mars have been isolated since their establishment before approx. 4.5 Ga. Therefore, there has been no giant impact or efficient global mantle convection to thoroughly homogenize the Martian mantle following the establishment of the SNC source reservoirs.

Author

SNC Meteorites; Tungsten Isotopes; Neodymium Isotopes; Planetary Geology; Mars Surface; Histories

20070023946 NASA Johnson Space Center, Houston, TX, USA

The Shergotites Are Young

Jones, John H.; August 13, 2007; 1 pp.; In English; 70th Annual Meeting of the Meteoritical Society, 13-17 Aug. 2007, Tucson, AZ, USA; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023946

Recently, Bouvier et al. (2006), interpreting their Pb isotopic data, have inferred that the shergottite suite of the SNC

(martian) meteorites have ancient ages of approximately 4-4.5 b.y. But conventional wisdom has it that the shergottites are much younger (approximately 500-150 m.y.) Are the shergottites young or are they ancient rocks whose ages have been reset by metamorphism or alteration?
Derived from text
Metamorphism (Geology); Shergottites; Geochronology; Meteoritic Composition

20070024457 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Europa: Processes and Habitability
Pappalardo, Robert T.; May 29, 2006; 19 pp.; In English; Planetary Science: Challenges and Discoveries, 29 May - 2 Jun. 2006, Blios, France; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40109

This viewgraph presentation reviews the known and possible geologic processes of Europa. It shows slides of Europa, with different terrains (ridged plains and molten plains), and a possible view of the interior. Europa's eccentric orbit is reviewed. The presentation also reviews Europa's composition. The possible reasons for Europa's geology are reviewed. Also the possiblity that life exists on Europa is raised. The planned Europa Geophysical Explorer mission is also reviewed.
CASI
Europa; Geophysics; Habitability; Geology; Extraterrestrial Life

20070024461 NASA, Washington, DC, USA
2006 NASA Strategic Plan
2006; 48 pp.; In English; Original contains color illustrations
Report No.(s): NASA/NP-2006-02-423-HQ; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070024461

On January 14, 2004, President George W. Bush announced A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration, a new directive for the Nation's space program. The fundamental goal of this directive is 'to advance U.S. scientific, security, and economic interests through a robust space exploration program.' In issuing it, the President committed the Nation to a journey of exploring the solar system and beyond: returning to the Moon in the next decade, then venturing further into the solar system, ultimately sending humans to Mars and beyond. He challenged NASA to establish new and innovative programs to enhance understanding of the planets, to ask new questions, and to answer questions that are as old as humankind. NASA enthusiastically embraced the challenge of extending a human presence throughout the solar system as the Agency's Vision, and in the NASA Authorization Act of 2005, Congress endorsed the Vision for Space Exploration and provided additional guidance for implementation. NASA is committed to achieving this Vision and to making all changes necessary to ensure success and a smooth transition. These changes will include increasing internal collaboration, leveraging personnel and facilities, developing strong, healthy NASA Centers,a nd fostering a safe environment of respect and open communication for employees at all levels. NASA also will ensure clear accountability and solid program management and reporting practices. Over the next 10 years, NASA will focus on six Strategic Goals to move forward in achieving the Vision for Space Exploration. Each of the six Strategic Goals is clearly defined and supported by multi-year outcomes that will enhance NASA's ability to measure and report Agency accomplishments in this quest.
Derived from text
NASA Space Programs; Space Transportation System; Aerospace Safety; Space Exploration; Space Shuttles; Mission Planning

20070024715 Tennessee Univ., Knoxville, TN, USA
Constraints on the Composition and Petrogenesis of the Martian Crust
McSween, Harry Y., Jr.; Grove, Timothy L.; Wyatt, Michael B.; December 13, 2003; 19 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-10728; NAG5-12896; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2003JE002175

Spectral interpretation that silicic rocks are widespread on Mars implies that Earth's differentiated crust is not unique. Evaluation of observations bearing on the composition of the Martian crust (Martian meteorite petrology and a possible crustal assimilant, analysis of Mars Pathfinder rocks, composition of Martian fines, interpretation of spacecraft thermal emission spectra, and inferred crustal densities) indicates that the crust can be either basalt plus andesite or basalt plus weathering products. New calculated chemical compositions for Thermal Emission Spectrometer (TES) global surface units indicate that

surface type 1 has basaltic andesite composition and surface type 2 has the composition of andesite. If these materials represent volcanic rocks, their calc-alkaline compositions on a FeO*/MgO versus silica diagram suggest formation by hydrous melting and fractional crystallization. On Earth, this petrogenesis requires subduction, and it may suggest an early period of plate tectonics on Mars. However, anorogenic production of andesite might have been possible if the primitive Martian mantle was wet. Alternatively, chemical weathering diagrams suggest that surface type 2 materials could have formed by partial weathering of surface type 1 rocks, leading to depletion in soluble cations and mobility of silica. A weathered crust model is consistent with the occurrence of surface type 2 materials as sediments in a depocenter and with the alpha proton X-ray spectrometer (APXS) analysis of excess oxygen suggesting weathering rinds on Pathfinder rocks. If surface type 1 materials are also weathered or mixed with weathered materials, this might eliminate the need for hydrous melting, consistent with a relatively dry Martian mantle without tectonics.
Author
Mars Surface; Petrogenesis; Planetary Crusts; Planetary Geology; Chemical Composition; Mineralogy

20070024763 Lawrence Livermore National Lab., Livermore, CA USA
Exoplanet Detection with Simultaneous Spectral Differential Imaging: Effects of Out-of-the-Pupil-Plane Optical Aberrations
Marois, C.; Phillion, D. W.; Macintosh, B.; May 05, 2006; 13 pp.; In English
Report No.(s): DE2007-899420; UCRL-PROC-221155; No Copyright; Avail.: Department of Energy Information Bridge

Imaging faint companions (exoplanets and brown dwarfs) around nearby stars is currently limited by speckle noise. To efficiently attenuate this noise, a technique called simultaneous spectral differential imaging (SSDI) can be used. This technique consists of acquiring simultaneously images of the field of view in several adjacent narrow bands and in combining these images to suppress speckles. Simulations predict that SSDI can achieve, with the acquisition of three wavelengths, speckle noise attenuation of several thousands. These simulations are usually performed using the Fraunhofer approximation, i.e. considering that all aberrations are located in the pupil plane. We have performed wavefront propagation simulations to evaluate how out-of-pupil-plane aberrations affect SSDI speckle noise attenuation performance. The Talbot formalism is used to give a physical insight of the problem; results are confirmed using a proper wavefront propagation algorithm. We will show that near-focal-plane aberrations can significantly reduce SSDI speckle noise attenuation performance at several e/D separation. It is also shown that the Talbot effect correctly predicts the PSF chromaticity. Both differential atmospheric refraction effects and the use of a coronagraph will be discussed.
NTIS
Aberration; Detection; Imaging Techniques; Optical Measurement; Planet Detection; Planets; Pupils; Spectra

20070025021 NASA Johnson Space Center, Houston, TX, USA
Lunar Orbit Insertion Targeting and Associated Outbound Mission Design for Lunar Sortie Missions
Condon, Gerald L.; March 2007; 27 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025021

This report details the Lunar Orbit Insertion (LOI) arrival targeting and associated mission design philosophy for Lunar sortie missions with up to a 7-day surface stay and with global Lunar landing site access. It also documents the assumptions, methodology, and requirements validated by TDS-04-013, Integrated Transit Nominal and Abort Characterization and Sensitivity Study. This report examines the generation of the Lunar arrival parking orbit inclination and Longitude of the Ascending Node (LAN) targets supporting surface missions with global Lunar landing site access. These targets support the Constellation Program requirement for anytime abort (early return) by providing for a minimized worst-case wedge angle [and an associated minimum plane change delta-velocity (V) cost] between the Crew Exploration Vehicle (CEV) and the Lunar Surface Access Module (LSAM) for an LSAM launch anytime during the Lunar surface stay.
Author
Lunar Orbits; Mission Planning; Orbit Insertion; Targets; Sortie Systems; Crew Exploration Vehicle

20070025041 NASA Johnson Space Center, Houston, TX, USA
Exploration Blueprint: Data Book
Drake, Bret G., Editor; February 2007; 603 pp.; In English; Original contains color and black and white illustrations
Report No.(s): JSC-63724; No Copyright; Avail.: CASI: A99, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025041

The material contained in this report was compiled to capture the work performed by the National Aeronautics and Space

Administration's (NASA's) Exploration study team in the late 2002 timeframe. The 'Exploration Blueprint Data Book' documents the analyses and findings of the 90-day Agency-wide study conducted from September - November 2002. During the summer of 2002, the NASA Deputy Administrator requested that a study be performed with the following objectives: (1) Develop the rationale for exploration beyond low-Earth orbit (2) Develop roadmaps for how to accomplish the first steps through humans to Mars (3) Develop design reference missions as a basis for the roadmaps 4) Make recommendations on what can be done now to effect this future This planning team, termed the Exploration Blueprint, performed architecture analyses to develop roadmaps for how to accomplish the first steps beyond LEO through the human exploration of Mars. The previous NASA Exploration Team activities laid the foundation and framework for development of NASA's Integrated Space Plan. The reference missions resulting from the analysis performed by the Exploration Blueprint team formed the basis for requirement definition, systems development, technology roadmapping, and risk assessments for future human exploration beyond low-Earth orbit. Emphasis was placed on developing recommendations on what could be done now to effect future exploration activities. The Exploration Blueprint team embraced the 'Stepping Stone' approach to exploration where human and robotic activities are conducted through progressive expansion outward beyond low-Earth orbit. Results from this study produced a long-term strategy for exploration with near-term implementation plans, program recommendations, and technology investments. Specific results included the development of a common exploration crew vehicle concept, a unified space nuclear strategy, focused bioastronautics research objectives, and an integrated human and robotic exploration strategy. Recommendations from the Exploration Blueprint included the endorsement of the Nuclear Systems Initiative, augmentation of the bioastronautics research, a focused space transportation program including heavy-lift launch and a common exploration vehicle design for ISS and exploration missions, as well as an integrated human and robotic exploration strategy for Mars. Author

NASA Programs; Interplanetary Flight; Mission Planning; Lunar Exploration; Mars Exploration

20070025086 NASA Johnson Space Center, Houston, TX, USA

ISRU at a Lunar Outpost: Implementation and Opportunities for Partnerships and Commercial Development

Sanders, Gerald B.; Simon, Thomas; Larson, William E.; Santiago-Maldonado, Edgardo; Sacksteder, Kurt; Linne, Diane; Caruso, John; Easter, Robert; 22 Oct. 2007; 2 pp.; In English; 9th ILEWG International Conference on Exploration and Utilization of the Moon, 22-26 Oct. 2007, Sorrento, Italy

Contract(s)/Grant(s): 387498.04.01.04.10; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070025086

The NASA Lunar Architecture Team (LAT), which was commissioned to help answer the question 'how' will humans return to the Moon, and the Synthesis Team and the recently released Global Exploration Strategy, which was commissioned to help answer the question 'why' will humans return to the Moon and go on to Mars have identified the ability to extract and use in-situ resources as important to extending human frontiers, reduce dependence on Earth, and further economic and commercial expansion into space. The extraction and processing of space resources into useful products, known as In-Situ Resource Utilization (ISRU), can have a substantial impact on mission and architecture concepts. In particular, the ability to make propellants, life support consumables, and fuel cell reagents can significantly reduce the cost, mass, and risk of sustained human activities beyond Earth. Potential lunar resources include solar wind implanted volatiles, vast quantities of metal and mineral oxides, possible water/ice at the poles, abundant solar energy, regions of permanent light and darkness, the vacuum of space itself, and even scavenging leftover descent propellants and/or trash and waste from human crew activities. Suitable processing can transform these raw resources into useful materials and products. The establishment of a human lunar Outpost, as proposed by NASA at the 2nd Space Exploration Conference in Houston in December 2006, opens up the possibility for the first time of breaking our reliance on Earth supplied consumables and learn to 'live off the land'. The ISRU phasing and capability incorporation strategy developed during LAT Phase I & II is based on the premise that while ISRU is a critical capability and key to successful implementation of the US Vision for Space Exploration, it is also an unproven capability for human lunar exploration and can not be put in the critical path of architecture success until it has been proven. Therefore, ISRU needs to take incremental steps toward the desired end state. However, at the same time, the lunar architecture needs to be open enough to take advantage of ISRU when proven available.

Author

Space Exploration; Lunar Exploration; Extraterrestrial Resources; Mission Planning; Lunar Resources; Life Support Systems; Consumables (Spacecraft)

20070025090 NASA Johnson Space Center, Houston, TX, USA

Surface Coatings on Lunar Volcanic Glasses

Wentworth, Susan J.; McKay, D. S.; Thomas,-Keprta, K. L.; Clemett, S. J.; [2007]; 1 pp.; In English; Geological Society of America Annual Meeting, 28-31 Oct. 2007, Denver, CO, USA; Copyright; Avail.: Other Sources; Abstract Only

We are undertaking a detailed study of surface deposits on lunar volcanic glass beads. These tiny deposits formed by vapor condensation during cooling of the gases that drove the fire fountain eruptions responsible for the formation of the beads. Volcanic glass beads are present in most lunar soil samples in the returned lunar collection. The mare-composition beads formed as a result of fire-fountaining approx.3.4-3.7 Ga ago, within the age range of large-scale mare volcanism. Some samples from the Apollo 15 and Apollo 17 landing sites are enriched in volcanic spherules. Three major types of volcanic glass bead have been identified: Apollo 15 green glass, Apollo 17 orange glass, and Apollo 17 'black' glass. The Apollo 15 green glass has a primitive composition with low Ti. The high-Ti compositions of the orange and black glasses are essentially identical to each other but the black glasses are opaque because of quench crystallization. A poorly understood feature common to the Apollo 15 and 17 volcanic glasses is the presence of small deposits of unusual materials on their exterior surfaces. For example, early studies indicated that the Apollo 17 orange glasses had surface enrichments of In, Cd, Zn, Ga, Ge, Au, and Na, and possible Pb- and Zn-sulfides, but it was not possible to characterize the surface features in detail. Technological advances now permit us to examine such features in detail. Preliminary FE-TEM/X-ray studies of ultramicrotome sections of Apollo 15 green glass indicate that the surface deposits are heterogeneous and layered, with an inner layer consisting of Fe with minor S and an outer layer of Fe and no S, and scattered Zn enrichments. Layering in surface deposits has not been identified previously; it will be key to defining the history of lunar fire fountaining.

Author

Soil Sampling; Lunar Soil; Crystallization; Volcanology; Beads

20070025093 NASA Johnson Space Center, Houston, TX, USA

STARDUST Curation and Science at JSC

Nakamura-Messenger, K.; Zolensky, M. E.; Bastien, R.; See, T. H.; Warren, J. L.; Bevill, T. J.; Todd, N.; Fletcher, L.; Horz, F.; Allen, C. C.; Westphal, A. J.; Snead, C.; Ishii, H. A.; Brownlee, D.; September 19, 2007; 1 pp.; In English; Discovery\@15 Conference, 19-20 Sep. 2007, Huntsville, AL, USA; Copyright; Avail.: Other Sources; Abstract Only

Dust particles released from comet 81P/Wild-2 were captured in silica aerogel on-board the STARDUST spacecraft and returned to Earth on January 15, 2006. STARDUST recovered thousands of particles ranging in size from 1 to 100 micrometers. During the six month Preliminary Examination period an international consortium of 180 scientists investigated their mineralogy/petrology, organic/inorganic chemistry, optical properties and isotopic compositions [1-7]. The Stardust samples are now available for research by the entire research community.

Author

Stardust Mission; Composition (Property); Mineralogy; Optical Properties; Petrology; Silicon Dioxide; Aerogels; Inorganic Chemistry

20070025094 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Diapir-Induced Reorientation of Enceladus

Pappalardo, Robert T.; Nimno, Francis; May 29, 2006; 12 pp.; In English; Planetary Science: Challenges and Discoveries, 29 May - 2 Jun. 2006, Blios, France; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40108

A viewgraph presentation on the diapir-induced reorientation of Enceladus is shown. The contents include: 1) Activity on Enceladus; 2) Miranda's Coronae: Origin above Diapirs; 3) Reorientation of Miranda; 4) Planetary Reorientation; 5) Modeling Diapir-Induced Reorientation; 6) Diapir-Induced Reorientation: Results; 7) Tectonic Implications of Reorientation; 8) Additional Tests of Reorientation; 9) Diapir-Induced Reorientation of Enceladus: Conclusions; and 10) Diapir-Induced Reorientation: Future Work

CASI

Enceladus; Planetary Geology; Intrusion; Structural Properties (Geology); Mathematical Models; Tectonics; Orientation

20070025096 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Titan Montgolfiere Mission Study
Lunine, Jonathan; Loenz, Ralph; Spilker, Tom; Elliott, John O.; Reh, Kim; May 4, 2006; 41 pp.; In English; Outer Planets Assesment Group Meeting, 4-5 May 2006, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40126

A viewgraph presentation on the Titan Montgolfiere balloon mission is shown. The topics include: 1) Science; 2) Operational Scenario; 3) Mission Architecture; 4) Aerial Vehicle; and 5) Summary
CASI
Titan; Balloon Flight; High Altitude Balloons; Titan Atmosphere; Planetary Geology

20070025098 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Navigation and EDL for the Mars Exploration Rovers
Watkins, Michael M.; Han, Dongsuk; June 21, 2006; 30 pp.; In English; Interplanetary Spacecraft Mission Seminar, 21-23 Jun. 2006, Daejon, Korea, Republic of; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40128

A viewgraph presentation on Deep Space Navigation, and Entry, Decent, and Landing (EDL) for Mars Exploration Rovers is shown. The contents include: 1) JPL Spacecraft Operating across the Solar System; 2) 2003 - 2004: The Busiest Period in JPL's History; 3) Deep Space Navigation Will Enable Many of the New NASA Missions; 4) What Exactly is Navigation vs. GNC for Deep Space?; 5) Cruise and Approach: Why is Deep Space Navigation So Difficult?; 6) Project Importance of GNC: Landing Site Selection; 7) Planetary Communications and Tracking; 8) Tracking Data Types; 9) Delta Differential One-Way Range (deltaDOR); 10) All Solutions Leading up to TCM-4 Design; 11) Entry Flight Path Sensitivities; 12) MER Navigation Results; 13) Atmospheric Entry Targeting and Delivery; 14) Landing Ellipse Orientation; 15) MER Landing Site Trade Example; 16) Entry, Descent and Landing: Entry Guidance or What Things Do We NOT do for MER Landings (but we will later...); 17) Entering Martian Space 8:29 p.m. PST (ERT); 18) Entry, Descent and Landing; 19) Entry, Descent and Landing: Terminal Guidance; 20) The Challenge Going from 12,000 mph to Zero in Less Than Six Minutes; 21) Spirit Landing Location; 22) Entry, Descent and Landing: The Future; 23) Powered Descent Time-Line; and 24) Updated Sky Crane Maneuver Description. A short summary is also given on planetary guidance, navigation and control as it pertains to EDL systems
CASI
Mars Exploration; Deep Space; Space Navigation; Descent; Mars Landing; Atmospheric Entry; Mars Roving Vehicles; NASA Space Programs

92
SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20070023714 National Optical Astronomy Observatories, Tucson, AZ, USA, National Solar Observatory, Tucson, AZ, USA
NOAO/NSO Newsletter: Issue 90
June 2007; 41 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This edition of the National Optical Astronomy Observatory/National Solar Observatory has science articles concerning: Wide-Field Survey Reveals the Variable Sky, A New Component of the Solar Magnetic Field, The Solar Oxygen Crisis, Disturbing News in the Large Magellanic Cloud. Other short articles on the NOAO, Observational programs and notes from the observatories are included.
CASI
Solar Magnetic Field; Solar Activity

20070025111 NASA Glenn Research Center, Cleveland, OH, USA
Apparent Relations Between Solar Activity and Solar Tides Caused by the Planets
Hung, Ching-Cheh; July 2007; 34 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 698671.02.03.03
Report No.(s): NASA/TM-2007-214817; E-15714-2; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070025111

A solar storm is a storm of ions and electrons from the Sun. Large solar storms are usually preceded by solar flares,

phenomena that can be characterized quantitatively from Earth. Twenty-five of the thirty-eight largest known solar flares were observed to start when one or more tide-producing planets (Mercury, Venus, Earth, and Jupiter) were either nearly above the event positions (less than 10 deg. longitude) or at the opposing side of the Sun. The probability for this to happen at random is 0.039 percent. This supports the hypothesis that the force or momentum balance (between the solar atmospheric pressure, the gravity field, and magnetic field) on plasma in the looping magnetic field lines in solar corona could be disturbed by tides, resulting in magnetic field reconnection, solar flares, and solar storms. Separately, from the daily position data of Venus, Earth, and Jupiter, an 11-year planet alignment cycle is observed to approximately match the sunspot cycle. This observation supports the hypothesis that the resonance and beat between the solar tide cycle and nontidal solar activity cycle influences the sunspot cycle and its varying magnitudes. The above relations between the unpredictable solar flares and the predictable solar tidal effects could be used and further developed to forecast the dangerous space weather and therefore reduce its destructive power against the humans in space and satellites controlling mobile phones and global positioning satellite (GPS) systems.
Author
Solar Activity; Tides; Planets; Space Weather; Solar Storms; Solar Flares

93
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*.

20070023912 NASA Johnson Space Center, Houston, TX, USA
Modeling the Prodromal Effects and Performance Reduction of Astronauts from Exposure to Large Solar Particle Events
Hu, S.; Kim, M. Y.; McClellan, G. E.; Nikjoo, H.; Cucinotta, F. A.; July 13, 2007; 1 pp.; In English; 18th Annual NASA Space Radiation Investigators' Meeting, 13-15 Jul. 2007, Rohnert Park, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

In space exploration outside the Earth's geomagnetic field, radiation exposure from solar particle events (SPE) presents a health concern for astronauts, that could impair their performance and result in possibility of failure of the mission. Acute risks are especially of concern during spacewalks on the lunar surface because of the rapid onset of SPE's and science goals that involve long distances to crew habitats. Thus assessing the potential of early radiation effect under such adverse conditions is of prime importance. Here we present a biologic based mathematical model which describes the dose and time-dependent early human responses to ionizing radiation. We examine the possible early effects on crew behind various shielding materials from exposure to some historical large SPEs on the lunar and Mars surfaces. The doses and dose rates were calculated using the BRYNTRN code (Kim, M.Y, Hu, X, and Cucinotta, F.A, Effect of Shielding Materials from SPEs on the Lunar and Mars Surface, AIAA Space 2005, paper number AIAA-2005-6653, Long Beach, CA, August 30-September 1, 2005) and the hazard of the early radiation effects and performance reduction were calculated using the RIPD code (Anno, G.H, McClellan, G.E., Dore, M.A, Protracted Radiation-Induced Performance Decrement, Volume 1 Model Development,1996, Defense Nuclear Agency: Alexandria VA). Based on model assumptions we show that exposure to these historical SPEs do cause early effects to crew members and impair their performance if effective shielding and medical countermeasure tactics are not provided. The calculations show multiple occurrence of large SPEs in a short period of time significantly increase the severity of early illness, however early death from failure of the hematopoietic system is very unlikely because of the dose-rate and dose heterogeneity of SPEs. Results from these types of calculations will be a guide in design of protection systems and medical response strategy for astronauts in case of exposure to high dose irradiation during future space missions.
Author
Mathematical Models; Solar Corpuscular Radiation; Astronaut Performance; Extraterrestrial Radiation; Radiation Dosage

20070023939 NASA Langley Research Center, Hampton, VA, USA
Description of a Generalized Analytical Model for the Micro-dosimeter Response
Badavi, Francis F.; Stewart-Sloan, Charlotte R.; Xapsos, Michael A.; Shinn, Judy L.; Wilson, John W.; Hunter, Abigail; August 2007; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 732759.07.09
Report No.(s): NASA/TP-2007-214886; L-19375; Copyright; Avail.: CASI: A03, Hardcopy

An analytical prediction capability for space radiation in Low Earth Orbit (LEO), correlated with the Space Transportation System (STS) Shuttle Tissue Equivalent Proportional Counter (TEPC) measurements, is presented. The model takes into

consideration the energy loss straggling and chord length distribution of the TEPC detector, and is capable of predicting energy deposition fluctuations in a micro-volume by incoming ions through both direct and indirect ionic events. The charged particle transport calculations correlated with STS 56, 51, 110 and 114 flights are accomplished by utilizing the most recent version (2005) of the Langley Research Center (LaRC) deterministic ionized particle transport code High charge (Z) and Energy TRaNsport WZETRN), which has been extensively validated with laboratory beam measurements and available space flight data. The agreement between the TEPC model prediction (response function) and the TEPC measured differential and integral spectra in lineal energy (y) domain is promising.

Author

Dosimeters; Mathematical Models; Extraterrestrial Radiation; Space Transportation System; Microinstrumentation

Subject Term Index

Personal Author Index